

CIO

The Magazine for Information Executives

BIG [AND NOT SO BIG] IDEAS FOR 2003

WHAT
YOU
NEED TO
KNOW
ABOUT

- * IT Spending Trends
- * Web Services
- * Intelligent Agents
- * Decision-Support Software
- * Instant Messaging
- * Global Outsourcing Hotspots
- * Biometrics
- * Security for the Enterprise

**[SPECIAL
NEW YEAR'S
ISSUE]**

THE LATEST ON

PHENOTROPICS,
WARCHALKING,
THIN TECHNOLOGY,
STEGANOGRAPHY,
DIGITAL THESPIANS,
NANOTECHNOLOGY,
BLOGGING, FUEL CELLS,
LASER COMBS,
PATENTS, MONTE CARLO
SIMULATIONS,
AND, OF COURSE,
THE SEGWAY SCOOTER.
AND MUCH MORE!

***plus**



W. BRIAN ARTHUR
ON I.T. RECOVERY



DAN GEER
ON PRIVACY



JARON LANIER
ON SOFTWARE DIVERSITY



MONIKA HENZINGER
ON WEB SEARCHING



EUGENE CHAN
ON GENOMICS

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deeper



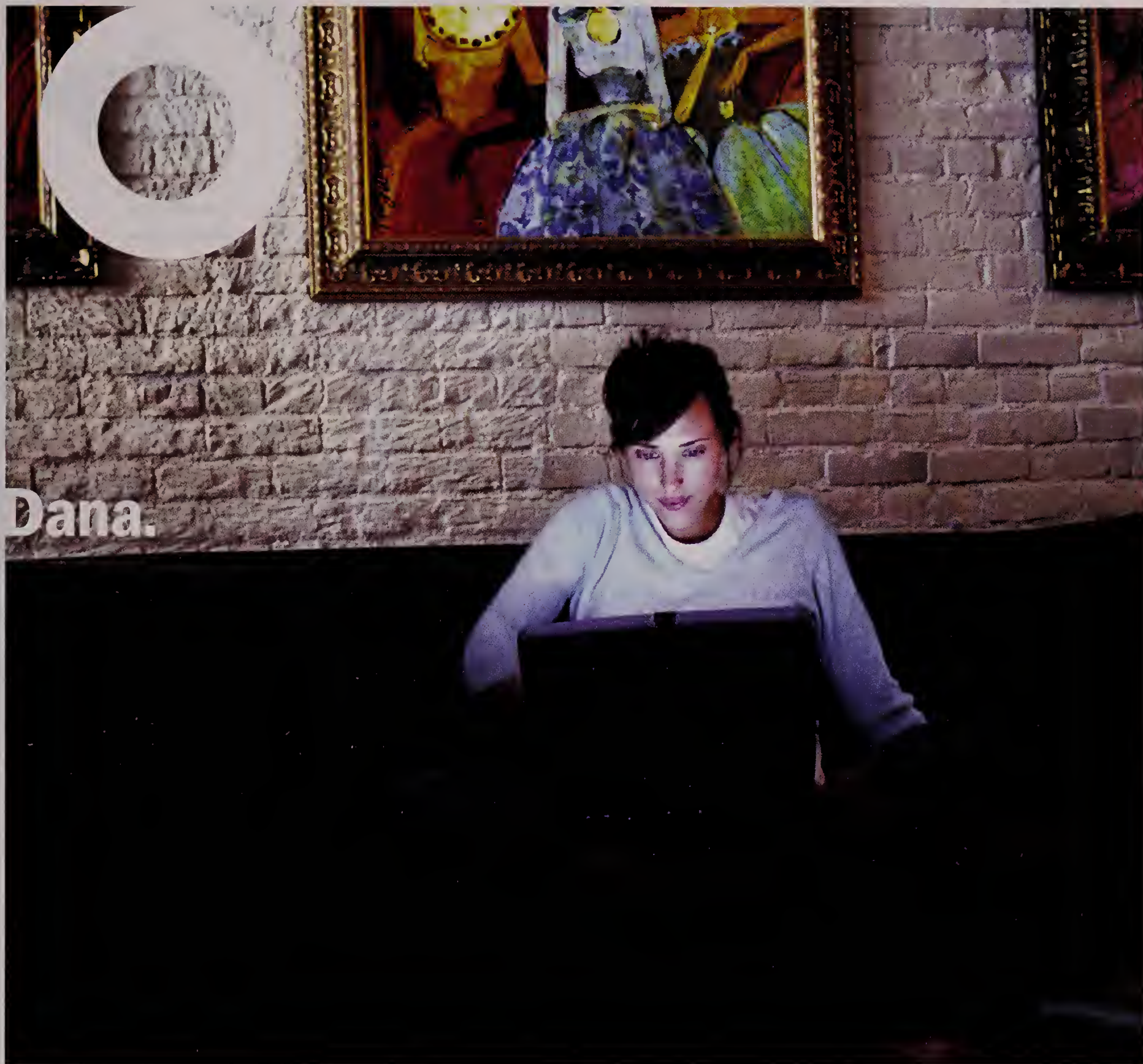
A man with a beard and mustache, wearing a dark suit, is shown in profile, looking at a laptop screen. He is sitting at a desk in what appears to be a server room or data center, with rows of server racks visible in the background. The lighting is dim, with the primary light source being the laptop screen and some ambient light from the server racks. The overall tone is professional and tech-oriented.

One degree between data

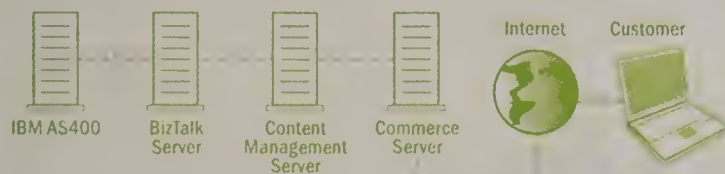
When software lets you use data to personalize customer connections, that's one degree of separation. The myriad of choices available to online consumers is staggering. The personal service available at traditional businesses is largely absent online and the pressure is on you to bring it back. Microsoft® solutions for Internet business provide the tools you need to build stronger relationships with your global network of customers and trading partners. Scalable user and content profiling allows you to target content and offer more personalized options including customer-specific catalogs with custom pricing and product information.

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and Dana.



The Royal Canadian Mint wanted to reach its diverse worldwide customers, expand sales of its products, and deliver a highly customized consumer experience, so they used the Web content management capabilities of Microsoft Content Management Server integrated with the e-commerce, personalization and backend data integration capabilities of Microsoft Commerce and BizTalk® Servers. Now the Mint can publish content in multiple languages, draw on customer information from its legacy database, and feed online orders through an existing ERP system, enabling the Royal Canadian Mint to offer customers a richer and more personalized experience.



Microsoft®



VOL. 16 • NO. 6 • DECEMBER 15, 2002 / JANUARY 1, 2003

SPECIAL ISSUE

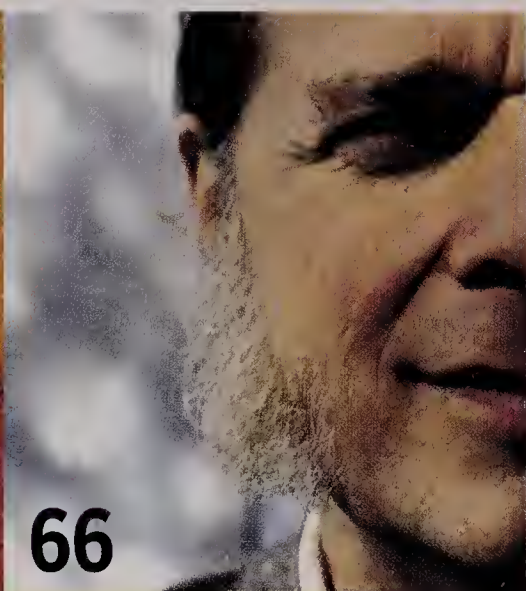
Big Ideas for 2003

[and not so Big]

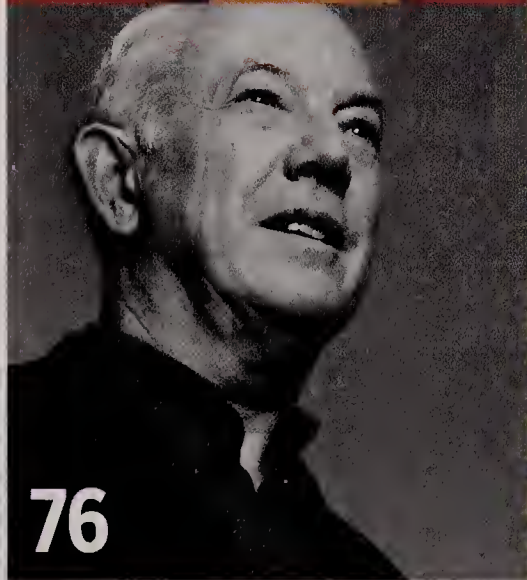
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What's new for 2003? (Clockwise, from upper left):
How about turning grandma's ashes into a diamond?
@Stake's Dan Geer says privacy is toast. GPS-based
services hit corporate America. And economist
W. Brian Arthur predicts an IT buildout.



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The Year of the CIO

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2003 WILL BE A BANNER YEAR for CIOs. In a majority of large companies, CEOs, COOs and CFOs have embraced the CIO as a fellow commander, ideally positioned to get a total view of the enterprise, streamline operations and take control of both dispersed data assets and the unchallenged tech spending habits of the turn of the millennium. And as the economic slump lingers, they're depending on the CIO to help drive strategy and find new revenue opportunities in the information-rich frontier of this new environment.

Converging with that is a new wave of technology innovation. Just as there is growing pent-up demand on the part of organizations, there's growing pent-up capability among providers. In 2003, some of this will start seeping into the marketplace.

But there are pitfalls for CIOs in 2003. It could be a make-or-break year for those who do not rise to the challenge—or those who are not afforded the opportunity by their companies' executive staff and board in the first place.

And all CIOs will face a rising tide of frustration and impatience among line of business and function execs who are eager to improve their own performance and who see technology as a way to do that. If CIOs don't find a way to start addressing these needs soon, they will be seen as an obstructionist. Providers offering products and services that go around the CIO will find an audience for their message. And once the money starts flowing again, a chunk of it will flow right past the island of the CIO.

To avoid becoming a victim of the IT end run (again) and the subsequent nightmare of having to repatriate all those renegade outposts of information and technology, CIOs must make collaborating with their business colleagues a top priority in the year ahead.

From all of us at *CIO* to all of you: Best wishes for a healthy, happy and prosperous New Year.

Albi Lundberg

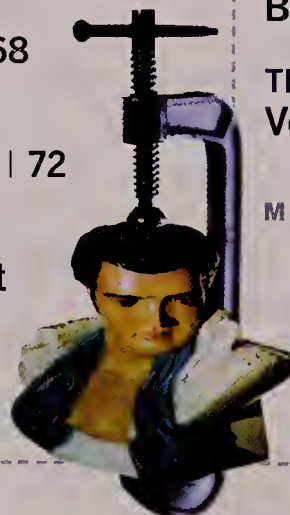
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MORE >>>

New digital music software called Ogg Vorbis lets you compress all the tunes you want, even Elvis hits, at no cost. Thank ya, thank ya very much. Page 72

Spacious corner office, redefined.

Business is no longer confined by four walls. Today, people need to access and exchange information – anytime, anywhere. Thanks to Siemens Next Generation Internet solutions, they can. From cellular phones to business communication systems to optical networks, we provide the tools that make Mobile Business a reality. As a leader in everything from information and communications, to healthcare to industry and automation, Siemens is in a unique position to make all our lives better. When you have 450,000 minds working together all around the globe, including 75,000 right here in the U.S., innovative solutions emerge. And that's what it takes to change the world.

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Here Comes the Buildout | 76**

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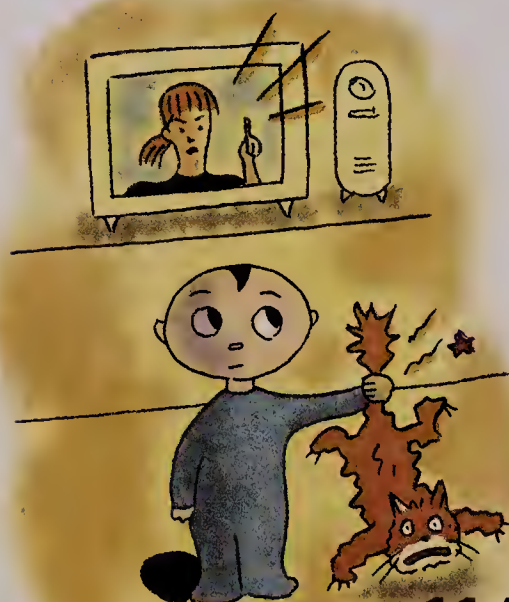
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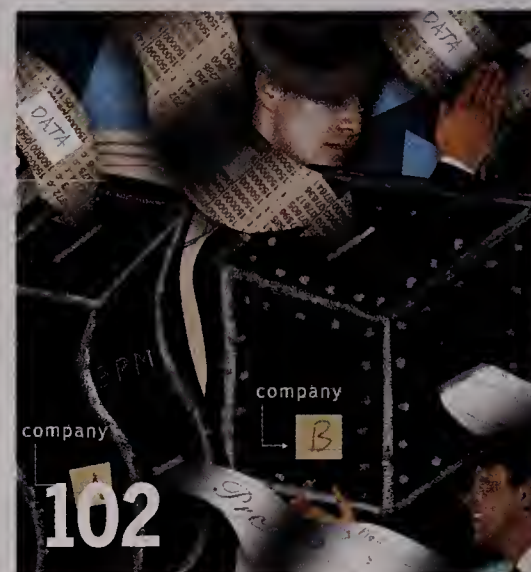
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From telebaby sitting (above) to nano-SUVs and wearable mainframes, these are notions for 2003 that we thought best left on the shelf. Page **114**

EMERGING TECHNOLOGY | 102 Process Power

Although workflow-oriented software is not new, the next generation of business process management (BPM) software is spreading beyond the leading-edge user set. These new BPM tools allow CIOs and end users to take a process-centric approach to IT projects and measure how effective those processes are.

By Martin LaMonica



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A few recent titles whose ideas about ideas may inspire CIOs in 2003; CIO Best-Sellers **ON THE MOVE | 32**

CIOs on the go—see where your IT peers are working now.

EMERGING TECHNOLOGY | 102

The latest process management tools put business users in control.

By Martin LaMonica

COOL PRODUCT | 106

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Nanowires that function as transistors, biomedical sensors and more.

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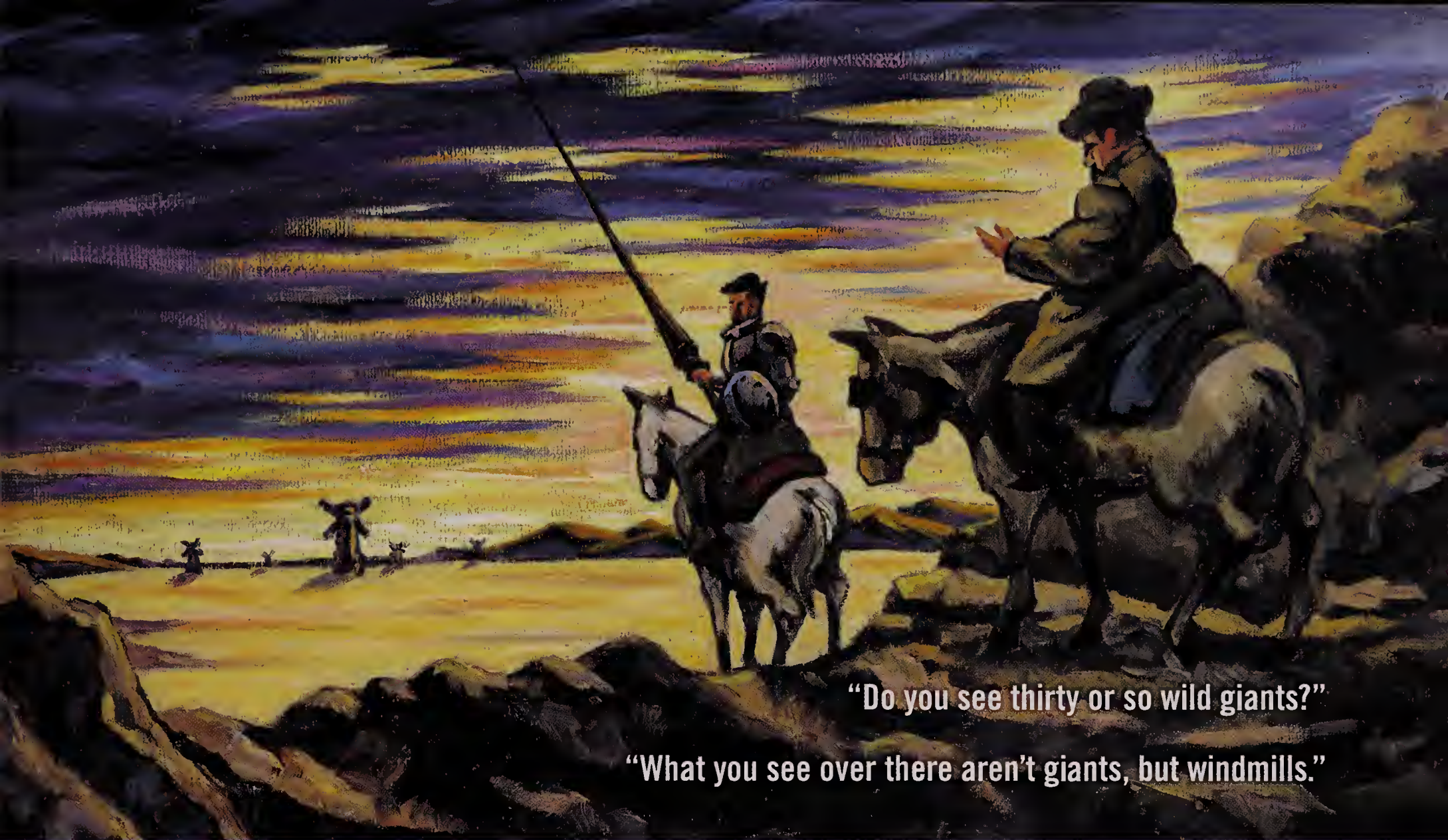
Corworks' compression tool trims the fat off storage.

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“Do you see thirty or so wild giants?”

“What you see over there aren’t giants, but windmills.”

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WEB >connections

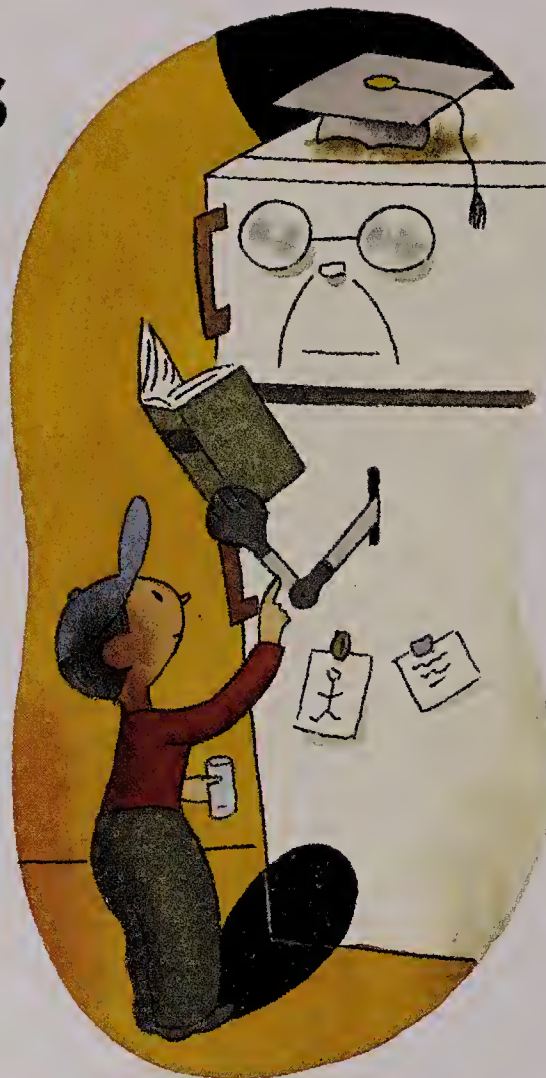
Interactive features from December 15, 2002 to January 15, 2003

WEIGH IN

What's the big idea—for 2003?

Do you have one? We show you ours (starting on Page 36), from algorithms (Page 56) to nanotechnology (Page 96). Now show us yours. What new technologies will change your business in 2003? What business processes will reveal new value? What collaboration tools will go mainstream? You're the practitioners; you're the experts. Tell us what you see coming down the pike.

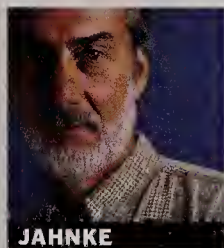
Find the link to this discussion in the **WEB CONNECTIONS** box at www.cio.com.



Editor's Picks Ask, and You Shall Receive

- What's the best way for a CIO to use external auditors?
- Is the CIO responsible for auditing his own systems?
- What are the top three areas that a CIO can focus on to support corporate finance?

Those questions—and hundreds more like them—come from readers who



JAHNKE

have found answers at CIO.com's Ask the Expert.

These questions were answered by Don Schulman, a leader of financial management solutions at PWC Consulting.

Like all the experts who sign on for CIO's two-week-long expert stints, Schulman is widely respected for his knowledge, and he willingly gives straightforward advice. Other recent experts have

included Howard Rubin, an executive vice president at Meta Group, and the security expert known as Mudge.

So if you have questions that require tough answers, or if you would just like to see what questions others have found answers to, visit Ask the Expert www2.cio.com/ask/expert. Our database is also easily searchable by topic, expert and date. Any questions?

—Art Jahnke,
Web editorial director

Peer Resources

From DARWINMAG.COM

www.darwinmag.com: The latest process management tools put business—not applications—in control (see Page 102). For the basics on workflow automation, read **The Correct Recipe for Workflow Automation**.

From CSO MAGAZINE

www.csoonline.com: CIO scored an interview with Santa's top IT exec (see Page 30). CSO recorded the New Year's resolutions of a half-dozen security executives in **Resolutions**.

Our Daily Web

MONDAY Tech Tact

Technology Editor Christopher Lindquist covers what's coming.



LINDQUIST

TUESDAY Quick Poll

Read what CIOs think about current IT issues.



SURMACZ

WEDNESDAY Metrics

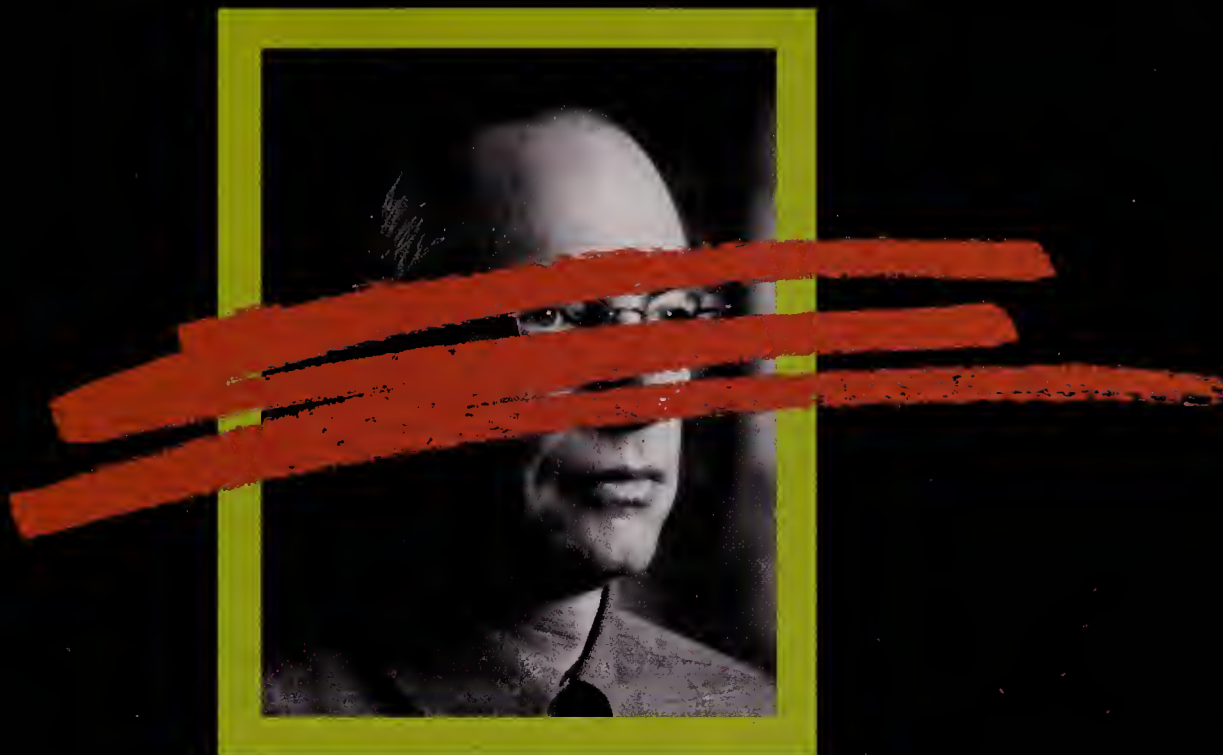
Web Writer Jon Surmacz makes sense of the numbers.

THURSDAY Sound Off

Web Editorial Director Art Jahnke opines on ethical dilemmas.

FRIDAY The Big Picture

Charts and graphs worth a thousand words.



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InBox

Reader Feedback

THE LAST WORD ON ERP?

As someone who had been involved with ERP implementations for 10-plus years, I must take issue with the comments made by reader Bob Paley in the Nov. 1 issue's InBox.

First, regarding the "marginal cost of producing an additional copy of software approaches zero," it's true—another CD or tape is not expensive, but then again neither is the production of one more miracle drug pill. Yet, like pharmaceutical companies, software developers must recoup the investment made in the creation of the first copy of that software. Implying that the price of the software should be related only to the physical cost of the materials is facetious thinking, at best.

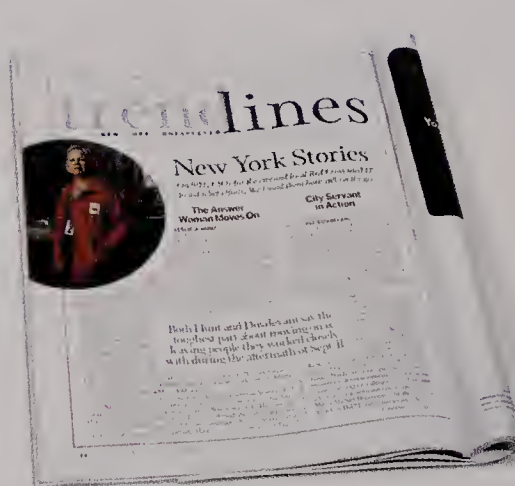
Second, implementation is still much more an art than a science. Variables such as the client's corporate culture, top management buy-in and individual employees' willingness to change their process are all essentially unknowable until (and often after) the implementation process begins.

As for remote training via interactive videoconferencing—this can work only if the attendees are given the opportunity by their managers to focus on the training. All too often, remote presentations are littered with endless interruptions—fires that need putting out, important phone calls from the boss and so on. Those distractions greatly reduce the effectiveness of any training effort. Worse still is the implicit message the trainees receive: Learning the new system takes a backseat to current crises that arise, and so it should not be taken so seriously.

Bob Fately
Vice President
Third Wave
Van Nuys, Calif.

9/11 LEADER

Shortly after 9/11, I met with former Red Cross CIO Leslie Hunt ["New York Stories," Sept. 1, 2002, www.cio.com/printlinks] and some of her staff on many occasions, in order to assist them with some IT issues. Leslie always exuded great leadership. She ran her department with efficiency and compassion under



limited resources. In turn, her staff truly loved working with her. You couldn't have selected a better CIO to profile. Thank you!

Nurya Bond
Consultant
PricewaterhouseCoopers
New York City

CIOs SHOULD BE ACCOUNTABLE

I thoroughly enjoyed your Hot Seat column "A Letter to CXOs" [Oct. 1, 2002, www.cio.com/printlinks]. With one major exception, your conclusion concurs with my company's experiences of helping CXOs focus their strategic IT

thinking on creating maximum value-for-money, rather than on creating IT.

The major exception is this: If CIOs do not take accountability for the overall value-for-money that their company creates from IT, then they should not expect to be regarded as fully paid-up members of the executive team. Broadly speaking, they will just be acting as an internal supplier of advice on IT systems and IT services and can expect to be treated as such.

Our experience in today's market is that the strategic IT agenda has changed, probably forever. Maximizing value-for-money is now firmly fixed as its key driver and measure of success. CIOs must recognize and grasp their pivotal role in the new agenda. Do you agree?

Chris Potts
Director
Dominic Barrow
London

Editor's note: Many CIOs say they deliver systems, business users exploit (or fail to exploit) the systems, and therefore, those users should be accountable and responsible for the value of the systems. Others say CIOs are responsible for making sure users derive value, otherwise it's a failing of the system design, of user training or both. The choice is often dictated by company culture, but no matter who is responsible, accountability is no good unless accompanied by authority.

WHAT DO YOU THINK?

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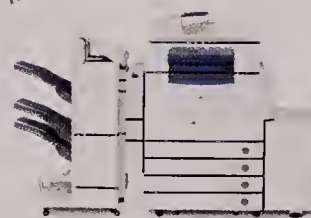
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trendlines

the **NEW** the **HOT** the **UNEXPECTED**

Edited by Lafe Low and Michael Goldberg

DATABASE TECHNOLOGY

A Bullets List

SINCE THE 1930s, police investigators have studied bullets to find key evidence. At a crime scene, investigators would retrieve any bullets and cartridge cases, and take them to police labs. There, firearms examiners would place the bullets and cartridge cases under a special microscope to compare the marks left by the firing gun on each. They would take snapshots and distribute them to local police departments. When police recovered a gun, they could discharge it to compare the markings left on bullets and casings against those in that collection of snapshots.

Technology changed all that about a decade ago. Now, in communities across the country, the ballistics imaging and matching process is computerized. Investigators still collect evidence at crime scenes, but software programs analyze ballistics images and store the results in databases. And databases from local and regional jurisdictions are linked together in the National Integrated Ballistics Identification Network (NIBIN). But the entries in this network of databases cover only guns seized by police.

This ability to analyze ballistics became a topic of interest recently, when a string of sniper shootings terrorized citizens around Washington, D.C., Maryland and Virginia before authorities caught and charged two suspects in the case. (It turns out that Maryland, along with New York, has created a statewide database for handguns owned there but not for rifles, which was the type of gun used in the sniper attacks.)

Now, some are calling for the creation of a national ballistic



A Virginia state trooper searches under a car at a gas station where one of last fall's Washington, D.C., area sniper attacks occurred.

fingerprint system that would enable police to trace bullets recovered from shootings in all states. Such a proposal is part of the gun control policy debate. But, politics aside, we wondered how technically difficult such a project would be, given potentially millions of gun records.

Not very difficult, says Joe Vince, a former chief of the crime guns analysis branch of the Bureau of Alcohol, Tobacco and Firearms (ATF). "Human fingerprints were once kept on file cards, and now there is a national electronic system," says Vince, who is now president of Crime Gun Solutions, a consulting company in Frederick, Md. "It should be no different for ballistic fingerprints."

Vince says such a national system would be based on a computer imaging product known as IBIS (Integrated Ballistic Identification System), which the ATF has used since 1993. IBIS, developed by Forensic Technology of Cote St.-Luc, Quebec, digitally captures images of bul-

Continued on Page 24

WEB LOGS

Phillip's Blog

Reporting live from the National Association of State CIOs convention in St. Louis, it's Utah CIO Phillip J. Windley! Almost daily since June, Utah's CIO has published entries on Windley's Enterprise Computing Weblog (www.windley.com). Windley's log of dated posts covers life as a CIO, thoughts on technologies like instant messaging and Web services, and reports from events, like the St. Louis confab. (To read more about blogs, see "Blogging for Bucks" on Page 74.) Why go to the trouble? Abundant communication, he explains, "is crucial to a high-performance organization." —Lafe Low

A stylized illustration of four business professionals walking towards the viewer in a modern office hallway. In the center is a man in a dark suit and tie. To his left are two women, one in a dark suit and the other in a light blue blazer and grey trousers, both carrying black handbags. To the right is a man in a dark suit with a yellow shirt and tie, holding a blue folder. The hallway has a high ceiling with recessed lighting and glass-walled doors on the right.

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Bullets

Continued from Page 22

lets and cartridge cases, stores them in a database, performs automatic computer-based comparisons of the images and ranks them according to the likelihood of a match. Firearms examiners can then perform microscopic comparisons of the likely candidates.

The IBIS system uses Oracle as its relational database management system. The system could expand to store all guns sold in the nation, says Serge Labrecque, one of the developers for IBIS. "Right now IBIS is a reactive product, taking an image once a crime has occurred" and evidence is recovered, Labrecque says. He adds that IBIS could support more information and images, with records received directly from gun-makers, before they sell or distribute the weapons.

Straightforward? Not so fast. Hurdles include getting local, state and federal police agencies to cooperate, says Wayne Eckerson, research director for The Data Warehousing Institute. "Modeling the database is the easy part," he says. "The challenge will be bringing together data owned by multiple agencies."

—Susannah Patton

SECURITY

Nobody's Perfect

JUST WHEN YOU THOUGHT Linux was safe, there comes along a well-documented threat that demonstrates the OS's vulnerability.

In September, the program Linux.Slapper.Worm spread itself through some 10,000 servers running the Apache Web server software. Though it was not considered a serious threat (the virus rated a 2 out of 5 on Symantec's severity scale), the worm installed backdoors, set up peer-to-peer networks between hundreds of infected systems and launched countless denial-of-service attacks.

This incident wasn't the first virus to hit Linux, and it certainly won't be the last. "As the installed base of Linux grows, we expect to see more such incidents," says Kevin Haley,

group product manager at antivirus software maker Symantec in Cupertino, Calif. And because the Linux community has reached a critical mass of millions, Linux.Slapper.Worm spells Linux's coming of age as a security target. IDC analyst Dan Kusnetzky says that of the 5.7 million server OS licenses sold in 2001, about one in four (26 percent) were Linux. Forty-nine percent were for Windows, and another 12 percent were for Unix, he says. (IDC and CIO's publisher have the same parent company.) IDC estimates that every paid Linux license spawns between 12 and 15 replicas. That's a tempting target for virus writers, Haley says. "As the installed base grows, we expect to see more incidents," he warns.

But don't panic. Linux viruses, which now make up about 1 percent of the Sophos anti-virus library, probably won't become commonplace, says Jack Cooper, the former CIO of drug company Bristol-Myers Squibb who founded JM Cooper & Associates, a supply chain and ERP consultancy. "Linux is built around the Unix security model, which is a relatively uninhabitable place for viruses," he says. Linux and its accompanying Apache Web server "have been exposed, attacked and patched for a much longer time than comparable Microsoft products," he says.

The Linux community "bands together to fix the problem" when one gets identified, adds Kusnetzky. That's comforting. But don't expect a panacea. "As soon as you say you don't have a problem, somebody will try to prove you wrong," Symantec's Haley says. "Never underestimate the determination of a rogue programmer."

—Geoffrey James



14 out of 14

The U.S. General Accounting Office interviewed 14 of the nation's largest 1,000 companies and found that all of them, 14 out of 14, monitored their employees' use of e-mail, the Internet and computer files. The GAO conducted the survey after some House members wondered about the federal government getting new authority to monitor electronic communications and Internet activities under the USA Patriot Act of 2001.

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Off the Shelf

Edited by Carol Zarrow

Good Ideas

Ideas are essential to a company's survival. Here are a few recent titles whose ideas about ideas may inspire CIO readers in 2003 and beyond.

The Deviant's Advantage: How Fringe Ideas Create Mass Markets

By Ryan Mathews and Watts Wacker
Crown Business, 2002, \$25.95

AS IF THEY SENSED the book's title *might* pose a problem, futurists and consultants Ryan Mathews and Watts Wacker waste no time assuring readers that they're using the word *deviant* in its purest form: something or someone away from the norm.

Deviance, they say, is the ultimate source of growth and innovation. So how do mainstream companies go deviant? By hiring people who will tell management when it's time to let go of old and tired ideas (and whom management will presumably thank instead of firing). This book is a wild ride and well worth the initial wince at the title.

What's Next? Exploring the New Terrain for Business

By Earmonn Kelly and Peter Leyden
Perseus Publishing, 2002, \$26

THE GLOBAL BUSINESS NETWORK rejects the notion that one theory fits all

when the topic is the future. Coauthors Kelly and Leyden (the GBN's president and knowledge developer, respectively) map the future's new terrain into four thematic areas and examine individual aspects of those themes in chapters populated with ideas from 50 artists, scholars, scientists and writers. The effect is remarkably like a live symposium and a solid demonstration of the GBN's mantra that "none of us is as smart as all of us."

A Passion for Ideas: How Innovators Create the New and Shape Our World

By Heinrich von Pierer and Bolko von Oetinger, eds.
Purdue University Press, 2002, \$24.95

HOW IS "the new" discovered? ask the editors of *A Passion for Ideas*, a collection of essays by or interviews with 26 innovators in the fields of art, music, business and science. These creative minds expound on how they "do creativity." Readers may doubt the subjects' calm assurances that creativity is possible, even easy. The book's central challenge, however, is persuasive and undeniable: All organizations have to come out for an encore or become irrelevant.

The Greatest Minds and Ideas of All Time

By Will Durant
Simon & Schuster, 2002, \$20

HISTORIAN and philosopher Will Durant was frequently asked for his opinion on the best, the greatest or the highest, and answered in a series of essays that originally appeared as magazine articles and lectures and have now been compiled into *The Greatest Minds and Ideas of All Time*.

CIO Best-Seller List

**5 Execution: The Discipline
of Getting Things Done**
by Larry Bossidy and Ram Charan
Crown Publishing Group, 2002

**4 Primal Leadership:
Realizing the Power of
Emotional Intelligence**
By Daniel Goleman,
Richard Boyatzis and Annie McKee
Harvard Business School Press, 2002

**3 Fish! A Remarkable Way
to Boost Morale and Improve
Results**
by Stephen C. Lundin, Harry Paul
and John Christensen
Hyperion, 2000

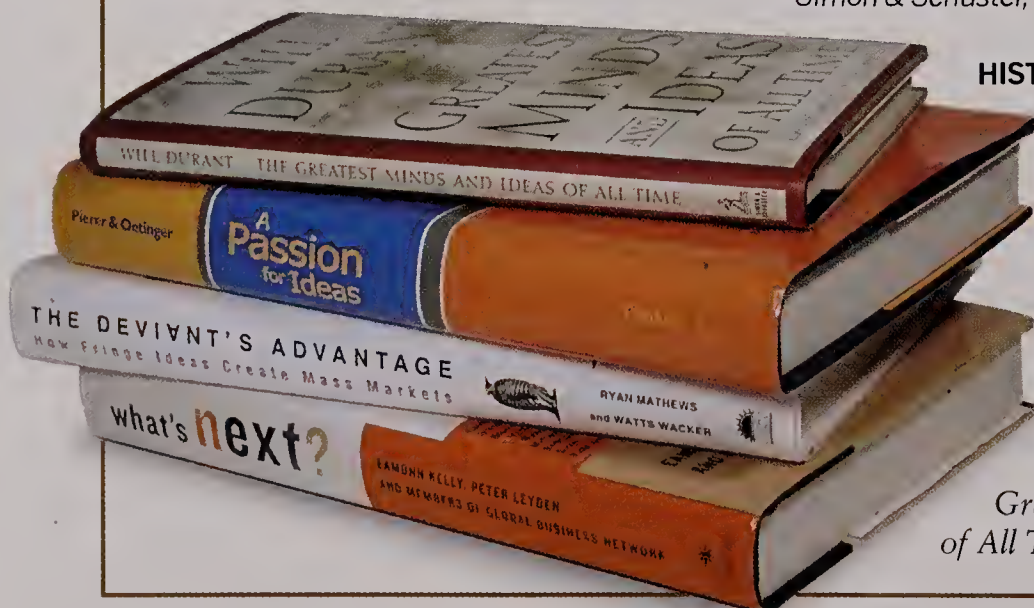
2 Leadership
By Rudolph W. Giuliani
Miramax Books, 2002

**1 Good to Great: Why Some
Companies Make the Leap...and
Others Don't**
By Jim Collins
HarperCollins Publishers, 2001

SOURCE: OCTOBER 2002 DATA, COMPILED BY
POWELL'S BOOKS, PORTLAND, ORE.

Numerous books have exhumed historical figures and propped them up as exemplars of modern corporate virtues. Thankfully, this lively little book is not one of those. Reading it is to experience Durant's great mind having fun. Readers will have fun too with this pure play of ideas.

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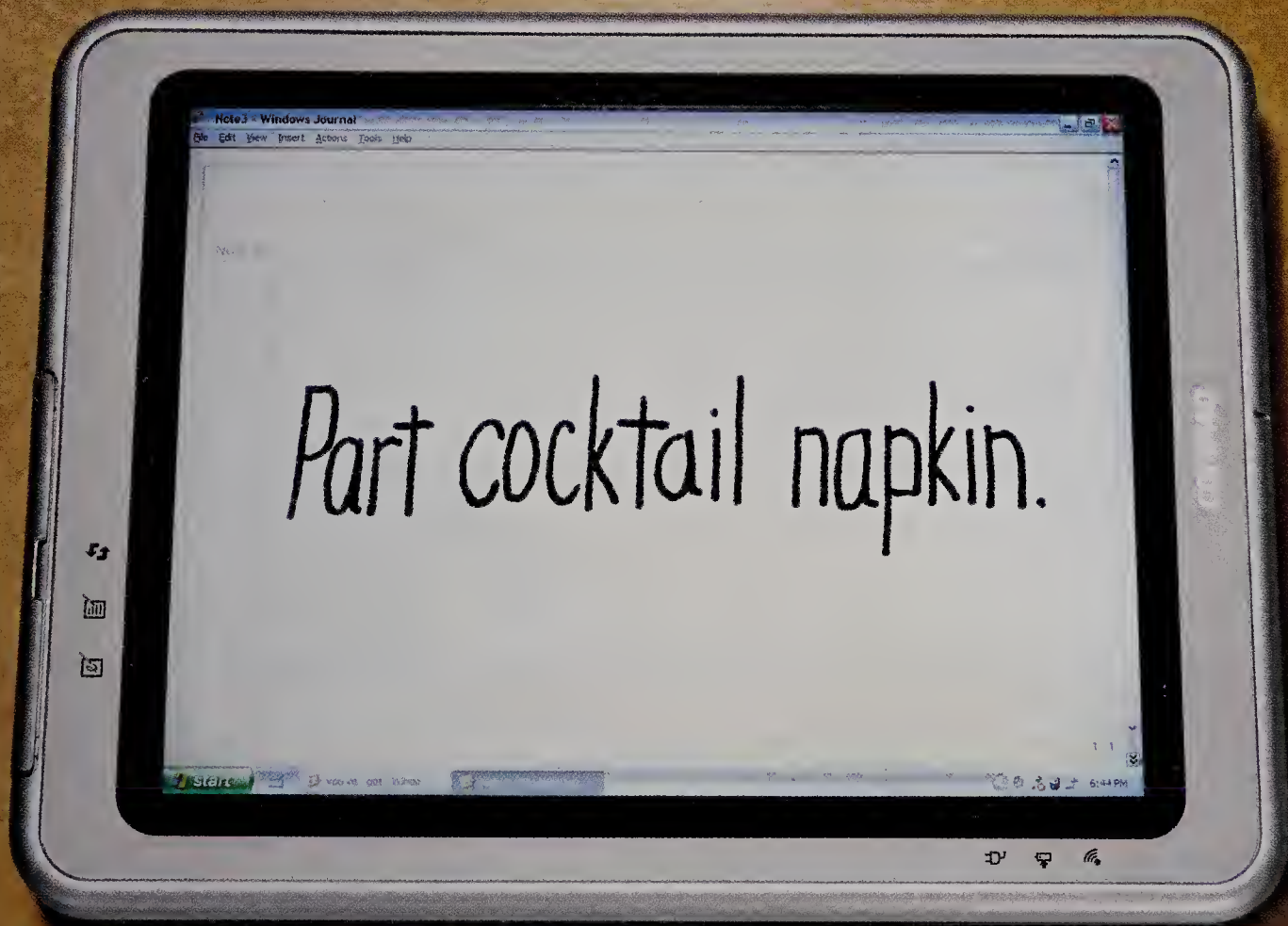


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HP recommends Microsoft® Windows® XP Professional for Mobile Computing.

GOVERNANCE

Disney's CIO Gets Serious

MICHAEL TASOOJI became Walt Disney's first corporate CIO in May 2000. Since then he has faced a formidable assignment: Cut costs, improve IT services and deliver business value through technology projects. Nothing new there, but Disney has always relied on a decentralized model. Each of the roughly two dozen business units (including theme parks, consumer merchandise, film studios, cable TV and broadcast networks) had its own IT chief. When you add it all up, it wasn't such a small world after all. The company's IT groups owned more than 1,000 projects, with responsibility to support more than 4,000 systems using products from 1,300 vendors.



Tasooji

So what's a CIO to do? Early in his tenure, Tasooji assembled an operating council of eight CIOs called the CIO Board to meet every six weeks to review ongoing and proposed IT projects. Those members also meet quarterly for two-day workshops as part of a 30-member IT Executive Management Council, made up of business unit IT heads and Tasooji's department. This council approves every IT program in the company and is responsible for seeing that decisions are implemented, Tasooji told the Gartner IT Symposium held last October.

Tasooji also formed an IT architecture committee last year. That led to a new enterprise portal that produced standards for business-to-employee and business-to-business information sharing, he said. The idea is to share costs and risks of existing and proposed IT projects across Disney while also allowing for new uses of technology to produce new customer services. Executives accompanying Tasooji cited two examples. Tony Tamburo, ESPN's senior vice president of MIS, said the cable sports network created an onscreen, sports-score line for viewers with data fed

by scoreboards at 229 professional and college sports venues. Roger Berry, senior vice president and CIO at Walt Disney World in Orlando, Fla., showed a demo version of a Mickey Mouse doll equipped with sensors that can direct visitors to attractions at the park where crowds have thinned. These innovations drive Disney forward, but the new set of centralized IT budget controls have signaled a cultural shift. "I have to say no, and that has been difficult," Tasooji said. —Dennis Blank

HOLIDAY I.T.

A Q&A with Santa's CIO

YOU THINK you have supply chain headaches? Try being Hermey Elfin for a day. As CIO of Santa Claus LLC's North Pole operations, Elfin manages a supply chain encompassing billions of toys, games, dolls and various other children's products that must be delivered to his boss's 2 billion customers between bedtime and dawn on Dec. 25. His sole means of delivery to all 24 time zones? Nine flying reindeer.

CIO recently sat down with Elfin as he was putting the finishing touches on the systems behind Christmas 2002.

CIO: How do you manage all of this?

HERMEY ELFIN: Well, up until about a year ago, we were operating in a complete legacy environment—so it wasn't easy. We had elves faxing hand-written orders to all of our suppliers—Playskool, Fisher-Price, the Island of Misfit Toys. We finally decided to implement an SCM system—though getting an integrator up here to the North Pole wasn't easy.

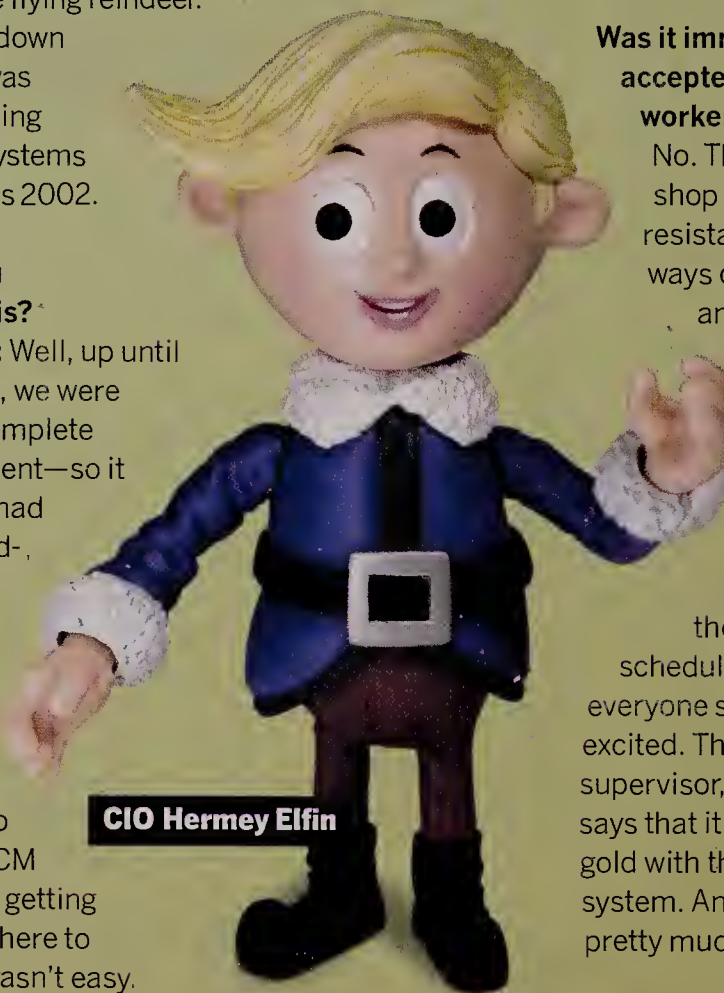
What was the rollout like?

Bumpy. Two months before the go-live date, [CEO Santa] Claus wanted to pull the plug because the integrators and elves couldn't agree on some specs. We almost lost Christmas 2001. We had to lock everyone in a conference room for one weekend and hammer out the requirements.

Was it immediately accepted by the line workers?

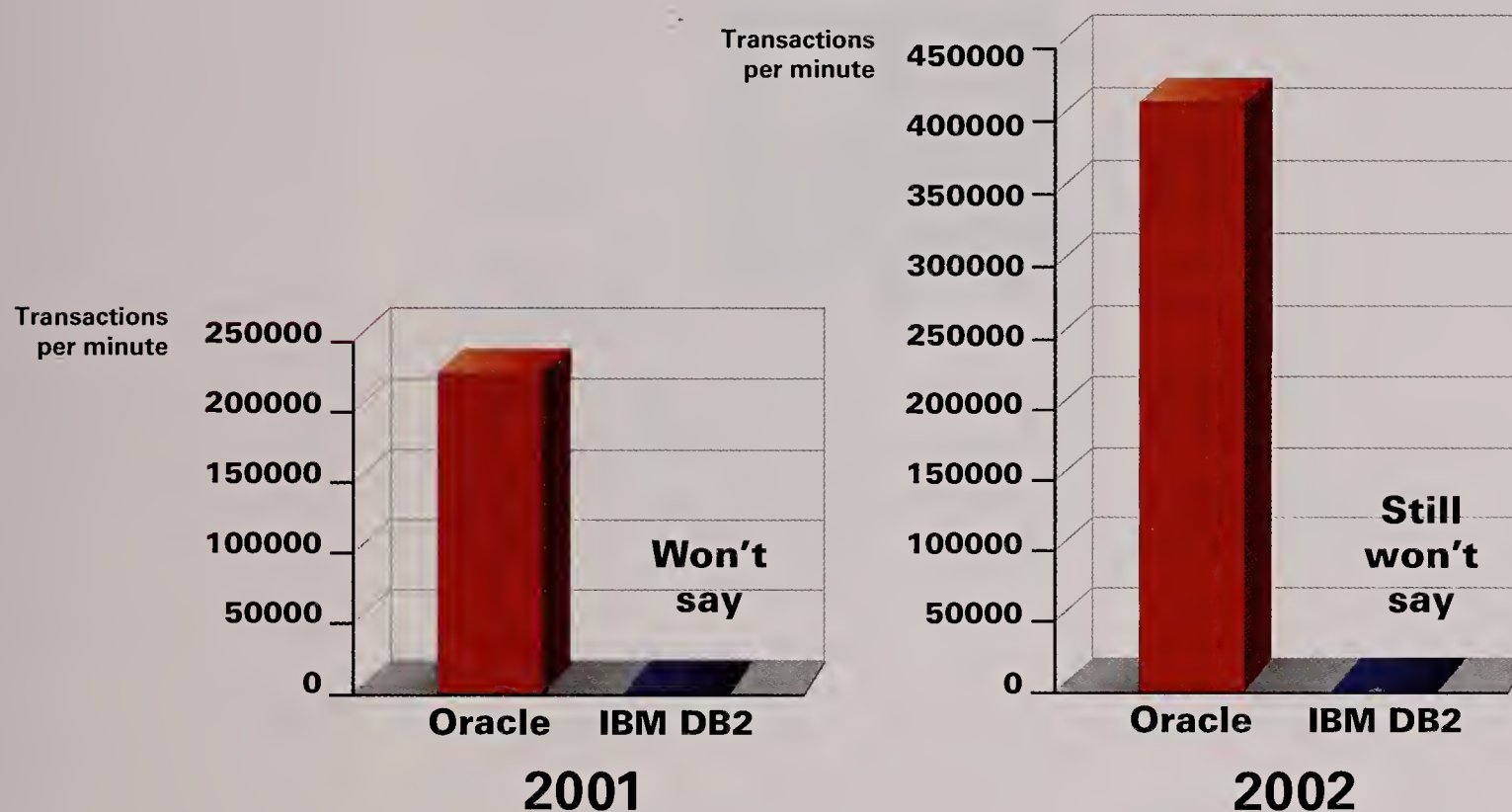
No. The elves on the shop floor were very resistant to the new ways of handling orders and keeping track of inventory, but I identified some super-user elves, and I showed them how it could improve their ability to schedule better. Now everyone seems real excited. The warehouse supervisor, Yukon Cornelius, says that it was like we struck gold with this supply chain system. And I think he's pretty much right.

—Tom Wailgum



CIO Hermey Elfin

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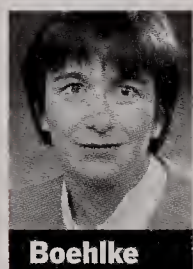
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On the Move

By Meredith Levinson

Maybe It's the Stock Options?

Believe it or not, CIOs are still joining dotcoms. Do they know something we don't? **SUE BOEHLKE** recently joined AutoTrader.com, an



Boehlke

Atlanta-based publisher of automotive classifieds on the Web. **WALTER WILLIAMS** has bounced from online flower purveyor Teleflora to a new position at Fandango, a Web-based movie-ticket seller.

In other dotcom news,

Internet retailer Drugstore.com has promoted **SRIDHAR IYER** to the position of vice president of technology and CIO. Says **KAL RAMAN**, president and CEO of the company, "In the past four years, Sridhar has demonstrated himself to be a committed and talented leader and a tremendous asset to Drugstore.com." (See "The Right Fit," Dec. 1, 2001, available at www.cio.com/printlinks.)

Speaking of drugstores, CVS finally found a successor for **HOWARD EDELS**, who retired as CIO of the Woonsocket, R.I.-based company last July after a 10-year tenure. **KARL TAYLOR** is the new top technology executive at the drugstore chain. Taylor previously served as senior vice president and CIO of now-defunct discount retailer Montgomery Ward.

Since we're on a roll with retailers, we should mention that San Francisco-based clothing retailer Gap named **BOB MARTIN** to its board of directors. Martin was an executive with Wal-Mart for 15 years, serving first as its CIO then as el presidente and CEO of Wal-Mart's international division.

Two for the Public Sector

California Gov. **GRAY DAVIS** has appointed University of the Pacific McGeorge School of Law professor **J. CLARK KELSO** as the state's CIO and special adviser on information technology. Kelso, 42, replaces **ELIAS CORTEZ**, who left his post in the wake of a scandal regarding his handling of a multimillion-dollar, no-bid contract with Redwood Shores, Calif.-based Oracle. Kelso's legal expertise will no doubt play an important role in

negotiating future contracts and in preventing the state from getting into more hot water over its vendor liaisons.

Former Wyoming Gov. **JIM GERINGER** is being even more disciplined with his state's IT—he put a former U.S. Marine, **BILL CAMPBELL**, in charge of the care, feeding and protecting of



Davis

Kelso

Wyoming's technology department. Campbell served as a data systems officer in the Marines for 10 years. Most recently, he was the IT director for

Holme Roberts & Owen, a national law firm headquartered in Denver.

Department of Energy

There's a lot happening in the energy sector these days (besides the now infamous downward spiral of Enron). Progress Energy, based in Raleigh, N.C., has consolidated its IT and telecom organizations into a single department. While consolidations like this usually mean a wave of pink slips, **DEDE F. RAMONEDA** managed to emerge without any scrapes or bruises. In fact, after the dust settled, she was promoted to vice president of information technology and telecommunications and CIO for the newly consolidated IT organization.

Keyspan recently lost its senior vice president and CIO. **CHERYL T. SMITH**, who also served as president of KeySpan Technologies, took a job with San Francisco-based health-care products and technology provider McKesson, also as senior vice president and CIO.

Twenty-four-year Southern Co. veteran **BECKY BLALOCK** has just assumed the role of senior vice president and CIO. Since joining the Atlanta-based utility company in 1978 as part of Georgia Power's accounting management program, Blalock has held positions in regulatory affairs, accounting, finance, customer service, information resources, marketing and corporate communications—now there's a multidisciplinary CIO.

On the Move Top Ten

Finally, in the spirit of David Letterman, we wrap up this year-end edition of *On The Move* with our own take on the infamous top ten list:

THE TOP TEN CIO MOVERS OF 2002.

- 10 **Jeri Dunn**, former CIO of Nestlé USA, joins Tyson Foods.
- 9 **William Seltzer** retires as CIO of Office Depot; former Quaker Oats CIO **Patricia Morrison** succeeds him.
- 8 **Bob Martin**, former CIO of Wal-Mart, appointed to Gap board of directors.
- 7 **David Bernauer**, one-time CIO of Walgreens, now CEO, appointed as chairman of the board.
- 6 **John A. Fiore**, CIO of State Street, resigns.
- 5 **Howard Edels**, 10-year CIO of CVS, retires.
- 4 **Darwin John**, former CIO of the Church of Jesus Christ of Latter Day Saints, joins FBI as CIO.
- 3 **Dennis Jones**, former FedEx CIO, "resigns" as president and COO of CommerceOne.
- 2 **Christopher Lofgren**, former CIO of Schneider National, promoted to CEO.
- 1 **Kevin Turner**, CIO of Wal-Mart Stores, promoted to president and CEO of Sam's Club USA.



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THE YEAR IN REVIEW

Big Issues of 2002

"SECURITY. COST CUTTING. SECURITY. SAVING MONEY. SECURITY." That's what one editor noted when we polled staffers to identify the major themes of *CIO*'s coverage this year. CIOs invested a huge chunk of their energy and time in managing costs and protecting their systems and employees against security breaches. When you consider the year's other important themes—business continuity, systems integration and an examination of the CIO's ethical responsibilities in an era of scandal and malfeasance—it's clear that 2002 was devoted less to trying out new stuff than to making what the enterprise already had work better and more safely. Looking back, this is the continuing story that we wrote about and put on our covers.

February 15 RETURN ON SECURITY INVESTMENT

In the past, CIOs attempted to justify IT security spending by trying to scare the pants off their board members with chilling anecdotes. Now they can use hard numbers

us to look for IT budgeting wisdom from CIOs at companies with low profit margins. Their advice: Invest only in projects linked to business goals with ROI due in three to six months. Check administrative and infrastructure costs for wasted dollars. And just say no to software upgrades.

July 1 ETHICS: TAKE THE PLEDGE

With pressure from the business to monetize customer data, the CIO today walks a razor's edge. Say yes to sales and marketing, and open oneself up to questions about the ethical use of such data; say no and be the bad guy who cuts off potential revenue streams. Our community of CIO readers proposes six

ethical commandments to help CIOs navigate this minefield.

September 1 DISASTER RECOVERY: STAYING POWER

Three CIOs who led business recovery efforts at their companies near Ground Zero represented Wall Street's comeback (at least in IT terms). All built up their business continuity programs—whether that meant moving into a new office building, equipping workers with wireless technologies or distributing IT assets geographically. A year after 9/11, they're back in business with lessons for their peers.

October 15 IT PROCUREMENT: GOOD STUFF CHEAP

The technology bubble went Pop! and now there's so much used hardware lying around—and so much emphasis on cost-cutting—that secondary market

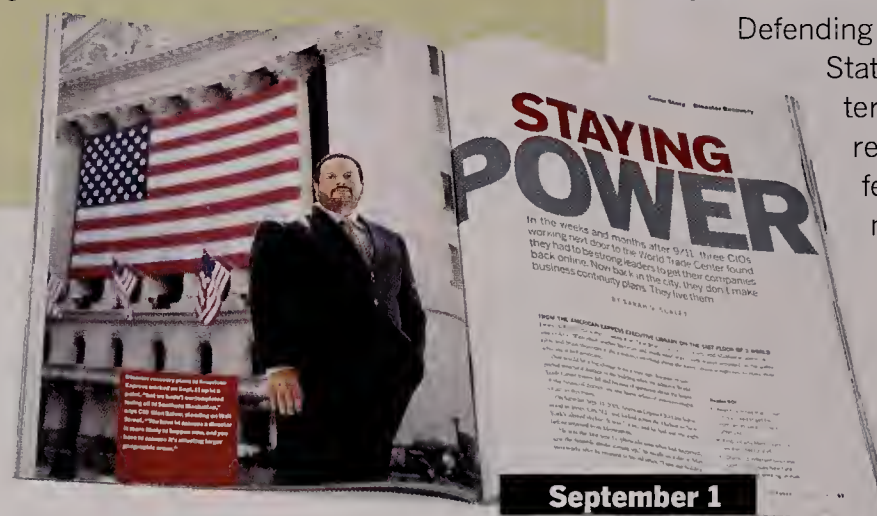
hardware is now a mainstream business. For CIOs, that spells operational savings, even if it means buying maintenance contracts in the emerging third-party market.

December 1, 2002 HOMELAND SECURITY

Defending the United States from terrorist attacks requires the federal government's biggest reorganization since World War II. The proposed Department of Home-

land Security demands the integration of hundreds of information systems at 22 agencies with offices around the globe and organizational cultures that many believe just won't meld. Who's going to make it work? The CIOs, of course. At least, they're going to try.

CIO.com To view the stories mentioned here, go online to www.cio.com/printlinks.



(developed by researchers at Carnegie Mellon, MIT and the University of Idaho) to show the ROI on their security investments. This ability could even lead to the development of a market for hacking insurance, with discounts offered for good security systems.

April 15 BUDGET BASICS: PENNY PINCHING ALL-STARS

A slowing economy led



"Akamai is helping FedEx extend its Web infrastructure to reach an expanding global customer base, and to provide fast, secure and reliable online transactions. Customers around the world know they can count on FedEx for superior service."

— Paul Rivera
Director of IT for Electronic
Commerce Development
FedEx Services

With Akamai, global expansion at FedEx takes off.

Akamai Gives FedEx the Competitive Edge.

When FedEx saw the opportunity to expand into the Asian market, they knew widespread use of their Web site was a key to success. But they also needed to avoid the time and cost required for international infrastructure deployment. FedEx turned to Akamai—with the world's largest globally-distributed computing platform—to extend and control its infrastructure without over provisioning.

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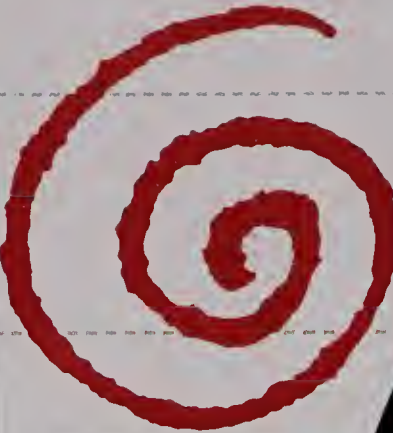
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The Competitive Edge for E-Business

A red spiral graphic, resembling a hand-drawn swirl, is positioned above the word "BIG".

BIG

[AND NOT SO BIG]

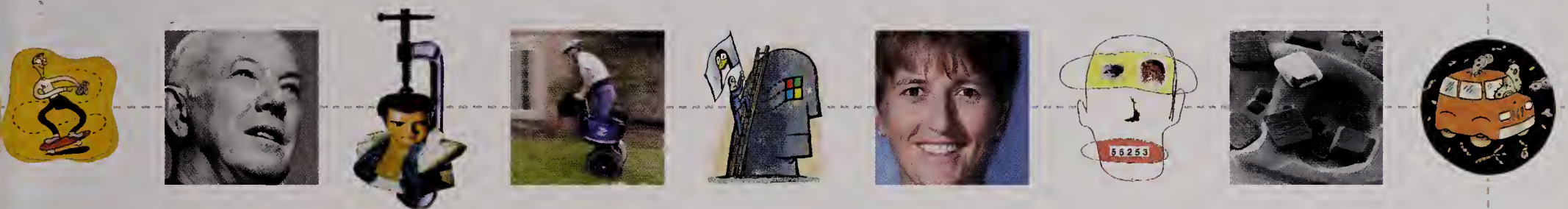
IDEAS

FOR 2003

It's been a brutal couple of years. Terrorism, preparations for war, a floundering economy, corporate scandal and malfeasance—it's left us shell-shocked, hoping that whatever comes next has got to be better.

We think it will be. Bubbling under the crust, in the creative hotbeds of companies and labs, and in the minds of entrepreneurs and dreamers, is a profundity of new technologies, new tools and new approaches—proof that no matter how twisted the rails of the bodies economic and politic, the engine of innovation keeps chugging along.

This special issue is devoted to highlighting those ideas as well as some trends



that will show up on your radar screen in the coming year. Some will enlighten (How Monte Carlo simulations can save you from the “Flaw of Averages”), others might scare you (How safe are your customer databases? Not very), and a few will entertain (Here’s how you can meet the future as a diamond). All of them will demand at least a few minutes of your time. And you never know: Any one of them might become central to your life and business in 2003.

So take a few minutes to get off the high-pressure interstate of mournful budgets, dour forecasts and workplace stresses. A new year is about to begin, and that’s a perfect time to rubberneck the new, the intriguing, the different.

Enjoy.

—Todd Datz, Senior Editor



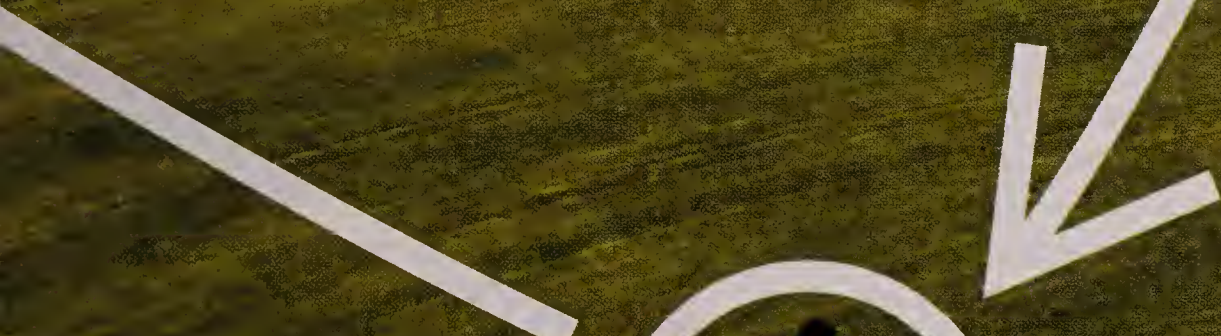
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NEEDS IT
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**CIO
DELIVERS IT
INSTANTLY**

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FINANCIAL REPORTING

1. No More Bogus Data

IN 2003, CIOs WILL need to think of themselves as CAOs—chief accuracy officers.

Until Enron came along, most CIOs never thought of themselves as accountable for data accuracy, only for storing and transporting information around the corporation without losing or corrupting it. If the data entered into the system was wrong, well, the CIO could not be held responsible for that.

But the wall separating data transport from data accuracy is crumbling. Investors no longer trust the people entering the data, and *BusinessWeek* predicts 250 companies will restate earnings this year, up from 50 in 1995.



As the SEC, Congress and investors push for more, better, faster financial reporting, CFOs and CEOs will increasingly look to the CIO as the steward of data accuracy. “CIOs won’t just be data logistics providers anymore; they will have to guarantee accuracy and timely delivery,” says Susan Dallas, research director for Stamford, Conn.-based Gartner.

One way that CIOs can try to improve data accuracy will be to help ensure that people aren’t entering bogus numbers from the start. There is precedent: Credit card companies use monitoring software that scans for unusually large or frequent charges and automatically posts a red flag. Companies will build similar systems to monitor for such suspicious events as an unusually high level of product returns, which could mean a manager is trying to inflate revenue by shipping things customers never ordered. And the software monitors will aim high. “We’re going to see a shift away from just monitoring low-level transactions like time cards toward monitoring high-impact transactions like who has the authority to sign a \$10,000 check and what they’re writing it for,” says Jack Heine, vice president and research director at Gartner.

“You’ll never be able to stop people from doing bad things, but you can make it hard to hide the bad things,” adds John Parkinson, chief technologist for the Americas at Paris-based Cap Gemini Ernst & Young.

But the monitoring systems can’t monitor what isn’t being entered into computers in the first place. Finance people routinely keep their numbers in Excel spreadsheets and crunch numbers manually, where no one can see what they’re doing. CIOs need to make all financial information digital and store it in one place. That’s going to take a lot of work. Companies have an average of 32 different financial systems

To avoid the financial shenanigans allegedly perpetrated by execs like former Enron CFO Andrew Fastow (here, in custody), CIOs will be called upon to ensure data accuracy.

for each \$1 billion in revenue, according to a study by Hackett Benchmarking, a division of consultancy Answerthink.

Nevertheless, if companies don’t respond with new systems to report data more quickly and accurately, investors and analysts may assume they have something to hide, given the current climate on Wall Street. “If there is an error in the reporting, it will be perceived as [financial shenanigans],” says Renee Lorton, senior vice president and general manager of PeopleSoft Financial Management Solutions in Pleasanton, Calif. “There is very little forgiveness out there right now.”

Despite a down economy, CIOs may finally get the money they’ve been asking for to integrate and build a data warehouse for financial data. “You can bet your bottom dollar that companies’ budgets are going to shift funds to what is a messy job, which is assuring end-to-end the accuracy of financial information,” says Ken Harris, CIO of San Francisco-based retailer the Gap.

In fact, the forced march toward better financial reporting could be a blessing in disguise for CIOs having trouble funding integration. In that sense anyway, CIOs may start to see Andy Fastow as not such a bad guy after all. —Christopher Koch

WEB SCAMS

2. Brother Can You Spare a Dime.com

A QUICK TRAWL THROUGH the biohazardous gleanings of my local spam filter demonstrates just how breathtakingly tawdry the Internet has become in its awkward adolescence. (And we all had such high hopes!) Hold an e-mail address long enough, and Beelzebub will beat a path to your inbox. Layered in there among the various blatant porno promos and



Would you give your money to Prada-obsessed, Web-panhandler Karyn Bosnak? (Apparently, many of you would.)

Nigerian found-money scam (that still eats up so much network bandwidth every day)?

Consider the case of Karyn Bosnak, a young New Yorker who plunged into debt buying way too many pairs of Prada pumps and other pricey accessories. As related recently on Salon.com, Karyn's creative solution to a staggering credit card balance was to become a cyberpanhandler via her own website, SaveKaryn.com. As of November, she had erased her \$20,000 debt, owing largely to the engaging candor of her spiel (she admits she's to blame for her mess), good marketing chops and some generous media-assisted word of mouth.

So brace yourselves for an epidemic of pathetic yarns, as

"enlargement" come-ons, it's a sure bet you'll find the Internet's very own three-card-monte games—designed to separate you either from some personal information you probably shouldn't surrender (hint: 16 digits and an expiration date) or else from your hard-earned \$29.95.

On television, you at least *get* that set of crappy knives, the ones that can cut through granite (which is apparently used as a garnish in some cuisines). But when you buy a tax lien on a phantom piece of Oklahoma real estate, where does your money go and what does it really buy you?

With the New Year upon us, what fraudulent delight will supersede the famous

legions of scammers, inspired by the success of Karyn Bosnak, make their way to your portal with their hands out and, maybe, a shiny little cybertear in their eye. If you feel your hand trembling atop the mouse, immediately click instead to www.pueblo.gsa.gov/scamsdesc.htm. It's the Feds' online consumer information site, which updates the latest in cyberscams and lets you know what to do when you think you've found one.

As for any Karyn wannabes out there, let them save themselves. —Lew McCreary

WI-FI

3. Easy As A, B, C, D, E, F, G, H and I

WHILE WI-FI IS A BRANDED certification for wireless LANs and wireless LAN products, it's also a catchy shorthand that's become synonymous with the products it certifies. And it's a lot easier than saying *IEEE 802.11b*, the technical term for conventional wireless LANs. But no matter what you call it, everything is coming up roses for Wi-Fi.

The Wi-Fi market doubled in 2002 and should grow another 60 percent in 2003, according to Gartner. Hospitals use Wi-Fi so that doctors can have bedside access to patient records. Warehouses use it for real-time inventory checks. Colleges and universities use it so that students can access the Web while sunning themselves on the quad. In other words, Wi-Fi is here and Wi-Fi is there. And soon it will be everywhere. The number of wireless hot spots (high-speed wireless Internet access points in such places as coffee shops and airports) will almost triple in 2003, exploding from 3,400 worldwide to nearly 10,000.

That means more access for more people, which, bizarrely, might be the one thing that slows Wi-Fi's march toward its manifest destiny. The

802.11 Standards That Will Be Ready in 2003

Each outstanding in its own way

C

helps improve interoperability between devices

D

improves roaming

E

is touted for its quality of service

F

regulates inter-access-point handoffs

G

works in the B spectrum but delivers speed and range of A

H

improves the 5GHz spectrum

I

addresses and improves security, by far the greatest impediment to wireless LAN adoption to date

Ideas 2003

protocol that dominates the market—802.11b—uses the 2.4GHz spectrum. It's a busy spectrum, full of baby monitors, cordless phones and microwave ovens, and the more traffic builds, the greater the chance for interference and drops in speed. Today, service is good and speeds are pretty fast. An 802.11b user can get connection rates of up to 11Mbps from up to three different information sources at a time, for maximum throughput availability of 33Mbps, before interference becomes a problem. In contrast, 802.11a, a competing wireless LAN standard that operates in the 5GHz spectrum, allows for speeds of up to 54Mbps from up to eight different access points at a time, giving it a greater range and max speeds up to 13 times faster. An even newer standard, 802.11g, works in the 802.11b spectrum, but delivers the speed and range of 802.11a.

Here's an analogy: 802.11b is VHS; 802.11a is BETA. BETA was a better product, but VHS had the market share. Luckily, the end game for wireless LANs won't be anything like it was for VCRs, thanks to 802.11g. Since G uses the same spectrum as B, the products are compatible. That means that CIOs can go right on investing in B technology and, when the time is right, use the same infrastructure and equipment to reap the greater speeds of G.

The bottom line, says Meta Group senior research analyst Chris Kozup, is that 2003 will see a "convergence of all of these [standards] into a single product. It will simply be that you buy a wireless LAN product and it can support any of them. Ultimately it takes the guesswork away from the user."

—Ben Worthen



JARON LANIER ON
SOFTWARE DESIGN

4. In Praise of Diversity

WALKING OUT OF HIS Manhattan apartment for his day job as lead scientist at the National Tele-Immersion Initiative, Jaron Lanier, the man who gave us the term *virtual reality* and was instrumental in developing the first virtual reality glove so that people could touch the digital universe, is only too happy to talk about what he thinks is coming in 2003.

"The thing I'm interested in now is a high-risk, speculative, fundamental new approach to computer science. I call it phenotropics," says the 42-year-old Lanier. By *pheno*, he means the physical appearance of something, and by *tropics*, he means interaction. Lanier's idea is to create a new way to tie two pieces of software together. He theorizes that two software objects should contact each other "like two objects in nature," instead of through specific modules or predetermined points of contact. With this type of protocol, there would be no previous agreement or expectation regarding the character of the exchange. Each software object would be responsible for "learning" how to interact with the other.

Lanier believes that phenotropics would allow for the development of bigger systems, perhaps a million times larger than the ones we can build today, because there would be no need to build connections between them. With this approach, he hopes to get around what he sees as the

Jaron Lanier thinks that current methods of software development are inherently insecure.

“brittle” nature of contemporary software. “Software tends to break before it bends,” he says.

He has been experimenting with phenotropics for years and says he has recently made breakthroughs in understanding how feedback would work in phenotropic systems. “That’s the dreamy stuff I’m doing,” he says. “I can happily make the prediction that it will have no firm impact on next year.”

Less dreamy, however, is the philosophy behind phenotropics and its implicit criticism of the way we work now.

“Essentially, we’re in wartime, so I suspect that next year is not going to be about fun innovation, but rather about managing contraction, stiffer competition, lower budgets and issues related to security,” he says. But he believes that current development practices will not allow for effective security. “The way we build software is monolithic and antiversity,” he explains as he strides through the streets of lower Manhattan. “If you have computers running identical software, that lack of diversity is a core [security] problem.”

Lanier looks to nature for examples of safety through diversity. “If we draw rough metaphors to natural viruses, the way they survive is through diversity,” he says. An antiviral agent that kills one virus will not kill another. By extension, an attack on one network would not be effective on another running a different species of software. But phenotropics would allow profoundly different systems to work together, thereby providing natural protection through diversity. “There is no security in monolithic networks,” says Lanier.

“Obviously, war has a big effect on everything,” he adds. “This could be an occasion to fix a lot of problems. It could be an occasion to have a political and social consensus on preparing the means for the next energy and transportation technologies but,” he concludes pessimistically, “that is not happening.”

—Lafe Low

COMPUTER MARKET

5. The Need for Speed Slows Down

FOR THE PC INDUSTRY, the introduction of ever-speedier computer chips used to translate into increased sales as consumers eagerly upgraded their desktops to get the latest, fastest technology. According to a recent survey, however, the correlation between computer speeds and consumer buying has vanished.

Since 1994, Odyssey, a San Francisco-based market research and consulting company, has surveyed consumers twice a year regarding their computer use and spending plans. In July, when Odyssey polled 2,500 households for its most recent survey, a little more than 10 percent of respondents who already own a PC said

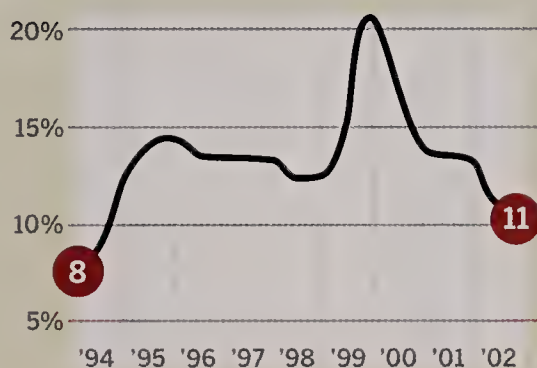
they were very likely to buy a new machine within the next six months. That’s the lowest percentage since 1994, and down from more than 20 percent in 2000.

While the shaky economy accounts for some reluctance to upgrade, Sean Baenen, Odyssey’s managing director, says the trend reveals a more troubling reality for the computer industry. Traditionally, existing PC owners were desirable targets for PC makers because they already were sold on the value of computers, and they tended to trade up to more expensive machines with higher margins. Now that fewer of those folks plan on buying the latest speed demons, the industry’s flagging fortunes are likely to continue until computer manufacturers overhaul their marketing approach. “PC manufacturers have been pushing more technology at lower prices, but that’s not the message consumers are interested in,” Baenen says. “Half of households with PCs have no idea how big their hard drives are or the speed of their processors; consumers look at PCs as a way to solve a problem.” For most consumers, e-mail, surfing the Internet and word processing work just fine on the machines they currently own. In other words, says Baenen, the beefed up machines offered by PC makers may be flashy, but they don’t provide consumers with new and compelling benefits. Hence, sales are dismal and the future looks bleak.

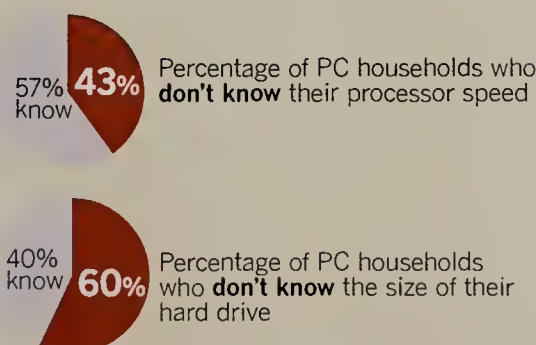
Baenen contends that PC makers can turn the tide by coming up with solutions to real consumer problems instead of fixating on speedier processing. One area that’s fertile for innovation is broadband. “It’s a pain to get a broadband connection, so if PC makers could figure out a way to make machines broadband-ready out of the box that would be a compelling benefit to upgrade,” Baenen says. Such an approach would also lift the fortunes of software developers and online service providers. In the meantime, PC makers will have to make do with sluggish sales.

—Megan Santosus

The percentage of PC households intending to purchase a new PC is at its lowest level since 1994



Technical specs are not compelling consumers to buy



SOURCE: ODYSSEY HOMEFRONT STUDY

BIOMETRICS

6. Customize Your Face

STATE-OF-THE-ART SECURITY technologies like retinal and facial scanning conjure up images worthy of a James Bond movie. Biometrics are quietly going mainstream, however, with practical nonsecurity applications that you don't have to be a secret agent to use.

The 3Di Station from San Jose, Calif.-based Geometrix will be coming in 2003 to an eyewear store near you. 3Di is a virtual system for trying on prescription eyeglasses. It uses two cameras to calibrate the exact shape and measurements of a customer's face, then generates a 3-D model. Customers can use the 3-D model of their face to try on different glasses—virtually speaking—and compare how they

look in several pairs side-by-side. Measurements that were once taken manually, faxed to a manufacturer and then typed into a computer are now sent directly from 3Di, which greatly reduces the chance for mistakes.

"Retailers are excited about it," says Arthur Zwern, president and founder of Geometrix. "It improves customer satisfaction, they can offer more styles than they stock in the store, and it's easier to upsell the consumer to higher value-added features like thinner lenses because they can see how much better they look."

Zwern expects that in the near future, facial biometric programs will be used for other nonsecurity applications such as virtually trying on makeup in stores to cosmetic surgery applications that will let a patient see exactly how her new nose will look. One can only wonder if Michael Jackson knows about this yet.

—Daintry Duffy

INSTANT MESSAGING

7. IM Goes Corporate

SUP, ATM BO, TTYL

Translation: What's up? At the moment, brain overload. Talk to you later.

That's IM speak—instant messaging—and it's coming to an office near you. On busy Wall Street trading desks, in fact, it's already here. Last spring, a consortium of eight leading investment banks extended an IM network to 2,000 institutional investor clients to allow easier communication among traders, brokers and clients. During the summer, equities traders and clients also signed on.

"IM is an excellent way to get information to a select number of people instantaneously," says Steve Pikowski, managing director in charge of global Web development in the equity department for Salomon Smith Barney. "It has an ideal audience with traders and sellers in equity and capital markets."

Long the obsession of gossipy teens, instant messaging software is finally invading the business world. Already, almost half of all U.S. and Canadian companies are using some form of IM, according to a survey by Osterman Research, a technology research company in Black Diamond, Wash. IM's faster than e-mail, delivering messages that pop up on your screen no matter what you're working on. Employees can use it to see if someone is in and to avoid time-wasting e-mail and phone tag. The software can also be used for customer support and to deliver messages to hundreds of users simultaneously. It seems a perfect fit for the busy enterprise.

But IM will need secure systems and common standards in order to succeed in business. Most business users still log on to the consumer applications launched by AOL Instant Messenger, Yahoo Messenger and Microsoft's MSN Messenger. (Yahoo announced in October it would ship IM



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software tailored for business users in early 2003.) But these services, which send unencrypted messages through public networks, create potential headaches for IT managers worried about firewall holes. These concerns have caused 22 percent of companies to block IM traffic altogether from their networks, according to Osterman Research.

Goldman Sachs, J.P. Morgan Chase, Merrill Lynch, Salomon Smith Barney and Sanford Bernstein chose Hub IM instant messaging software from Communicator, which connects businesses without requiring them to use a common e-mail server (as AOL and Microsoft's IM systems do). Communicator is one of several companies, including IBM subsidiary Lotus Software and pureplay startups Jabber and Bantu, that are tailoring IM software for business clients. Communicator's system ties into the Wall Street consortium's portal, Bond.Hub, and requires users to identify themselves before accessing database information. Communicator doesn't let users assume the aliases found in consumer IM, which ensures that they can be verified against the directory.

IM is not likely to replace the telephone and e-mail altogether. Some people don't want or need instant communication. In fact, Pikowski says his biggest challenge is to boost the adoption rate in Smith Barney's equity division, where 800 out of the 1,200-member staff are using IM. As newly minted college grads come into the

labor market, however, that task will get a lot easier.

"The younger generation has already adopted IM," Pikowski says. "There's no stopping it now." —Susannah Patton

DATABASE SECURITY

8. Identity Crisis

IF IDENTITY THEFT ISN'T already on your radar screen, this headline will put it there: "13,000 Credit Reports Stolen by Hackers." Ford Motor's customer credit reports, containing a treasure trove of identifying information such as Social Security, bank account and credit card numbers, had been lodged in a supposedly secure database at Experian, one of the nation's biggest credit agencies. The hackers simply bypassed security by posing as employees of Ford.

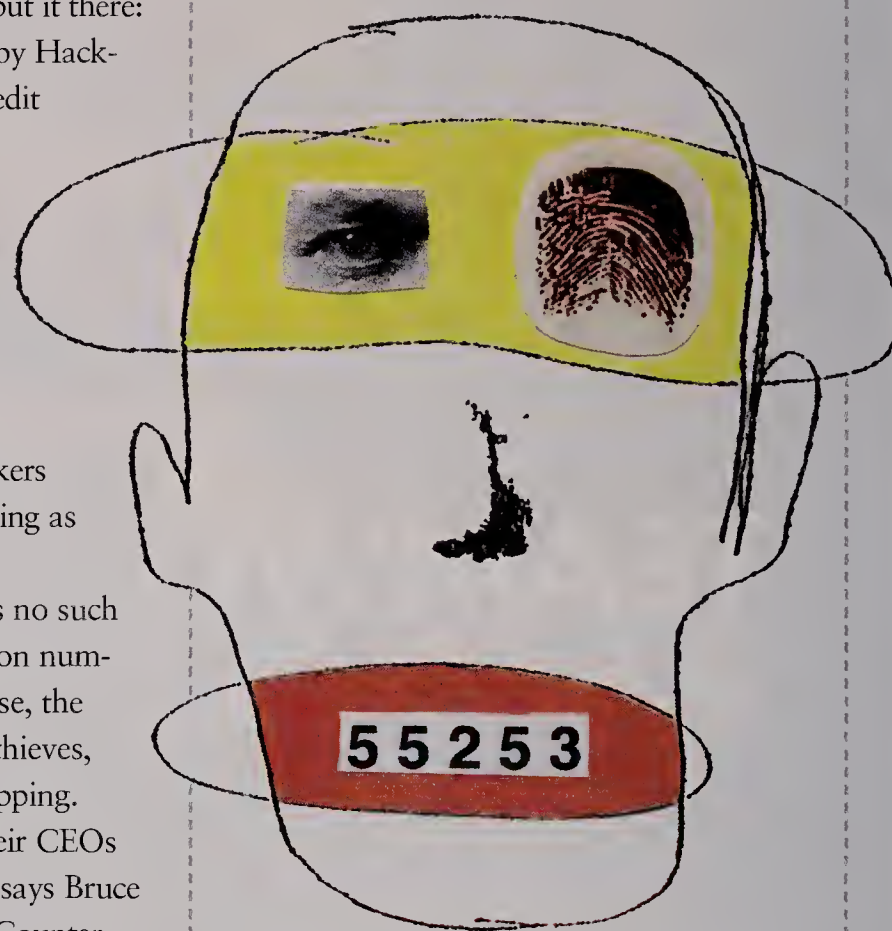
Lesson number one: There is no such thing as infallible security. Lesson number two: The bigger the database, the more tempting it is to identity thieves, who much prefer one-stop shopping.

"CIOs should stop telling their CEOs that technology is the answer," says Bruce Schneier, founder and CTO of Counterpane Internet Security of Cupertino, Calif., and a nationally recognized authority on security. "CIOs have to accept the fact that all that security just doesn't work; you have to build your systems assuming they will fail."

The trick is to build them to fail robustly so that if one firewall is breached, you have a dozen other precautions in place to blunt

the attack. Because attack they will. Identity theft is a mushrooming problem in corporate America, as companies lost almost \$12 billion to online identity theft in 2001, according to the Identity Theft Resource Center, a nonprofit clearinghouse in San Diego. Approximately 750,000 cases of identity theft are reported to authorities every year, center officials say.

The free flow of customer information via the Internet is one reason why identity theft has tripled in the past five years. But so is the huge desire on the part of credit card companies to extend instant credit



and then rely on one identifier to authenticate a customer's identity. There is a growing black market in credit card and Social Security numbers, and the push toward authenticating identity with one supposedly unbreachable identifier, like a fingerprint, has the potential to only make matters worse.

"If I steal your password, a credit card company can issue you a new password," says Chris Hoofnagle, legislative counsel for the Electronic Privacy Information Center in Washington, D.C. "But if people are able to lift a latent fingerprint of yours and reproduce it in a mold—and this can

Some Instant Messages for the Mature Executive

MESSAGE: WHTS R STCK PR 2DA? OH, @\$!*#

TRANSLATION: What's our stock price today? Oh, @\$!*#

MESSAGE: THS MSG JST TK M 20 MINS 2 RIT

TRANSLATION: This message just took me 20 minutes to write.

MESSAGE: H ANY1 SMG?

TRANSLATION: Has anyone seen my glasses?

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be done—you can't be issued a new fingerprint. So how do you prove you are you?"

Schneier agrees. "The reason identity theft is so powerful is that much of our security today is based on your identity," he says. For example, many insurance companies, financial institutions and government agencies (like the Registry of Motor Vehicles) rely primarily on Social Security numbers as identifiers. So if someone knows your Social Security number and a few other facts about you, he can easily steal your identity.

"As long as security relies on identity, then ID theft becomes an effective way of committing fraud," Schneier adds. "And creating stronger IDs [through biometrics] only makes the problem worse."

Likewise, putting all of your customer information in one central database only heightens the chance that identifying information will be stolen. After all, it's much easier to break into a large centralized database than small separate databases.

And resourceful thieves will always find a way around the toughest security, as Ford and Experian have learned to their chagrin.

To avoid a similar disaster on their turf, CIOs should insist their company's customer data be kept in separate databases protected by a number of different security measures. And they should push their company to adopt safer business practices that require customers and employees to use a number of different identifiers to gain access to personal data. For retailers, that might mean implementing other business safeguards, such as matching the shipping address with the home address on customers' credit reports. In the meantime, legislation that bans the use of Social Security numbers and other personal identifiers in instant credit e-mails or letters has already been passed in California and is being considered in other states.

"If you had a dozen IDs and they weren't linked together, now that would be difficult to steal," Schneier says. "Decentralize, distribute. There is never one answer to security."

—Alison Bass

LEISURE

9. Relax. Don't Do IT.

FACT: AMERICANS WORK too much. The Bureau of Labor Statistics reported that almost 26 million Americans spend 49 or more hours a week on the job. Of those workaholics, nearly 11 million work 60 or more hours weekly. And while the Japanese have cut 191 work hours from their average annual total in the past decade, Americans have added 58 according to an Aug. 26, 2002, article in *BusinessWeek*.

U.S. employers are also famous for taking meager vacations, compared with the rest of the developed world. And according to a survey by online travel agent Expedia.com, U.S. workers don't even take the time they've got, leaving an average of 1.8 vacation days a year unused.

In IT, the work-life balance may be even more lopsided. There is a widespread expectation that IT workers should be available 24/7, according to John Hummel, CIO of Sutter Health, a Sacramento, Calif.-based health delivery organization.

The recession has only made things worse. "We're seeing burnout with all the cost pressures and a need to get greater productivity out of fewer people," Hummel says.

But there are signs that American workers are getting tired of all work and no play, and in 2003 IT leaders may come around as well. In a recent survey by Yankelovich Partners, a research company based in Chapel Hill, N.C., workers who were offered either two weeks extra pay or two weeks extra vacation preferred the extra vacation. Beverly Lieberman, president of executive recruitment company Halbrecht Lieberman Associates in Stamford, Conn., says she has noticed two-week vacations becoming a trend among CIOs—something she calls "a real breakthrough."

But she quickly adds that these vacationing executives rarely untether. "It's just not possible for most CIOs to completely disconnect," Lieberman says. "They take along their BlackBerrys or laptops and at least periodically check their e-mail."

The key to letting go is delegation, says Philip Schneidermeyer, managing director of the IT executive recruiting company Talent Intelligence Agency in Darien, Conn. "A successful CIO is delegating, especially the tactical, day-to-day opera-



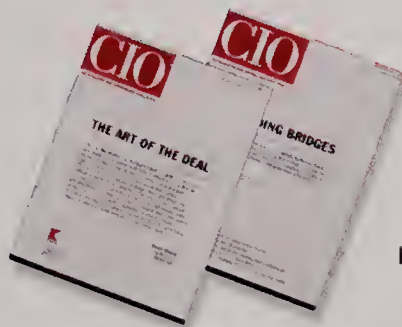
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DISCOVER
THE
POSSIBILITIES



December 2002

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Sincerely,

A handwritten signature in dark ink, appearing to read "Paul Shorthose".

Paul Shorthose
President and CEO



tional details, and should therefore be able to schedule regular time off."

Joe Gagliardi, CIO of Miami-based shoemaker Unisa, is one IT leader who long ago decided that if he didn't completely disconnect on vacation, he wouldn't get the mental distance he needed to recharge. Six years ago, he started an annual tradition of taking a 10-day vacation with his wife at a remote Jamaican beach resort with no phone and only one satellite TV. His cell phone doesn't even work there.

"It usually takes three days before the steam stops coming out of my ears," he says. "By the fourth day, I'm drinking a Mai Tai or something at breakfast and not wearing a wristwatch. I've learned that you can push yourself to the point of sickness and that you need to find a way to unwind to get the poisons out. This is my way."

Think about it. —Mindy Blodgett

WIRELESS ACCESS

10. Coming to a Sidewalk Near You: Warchalking

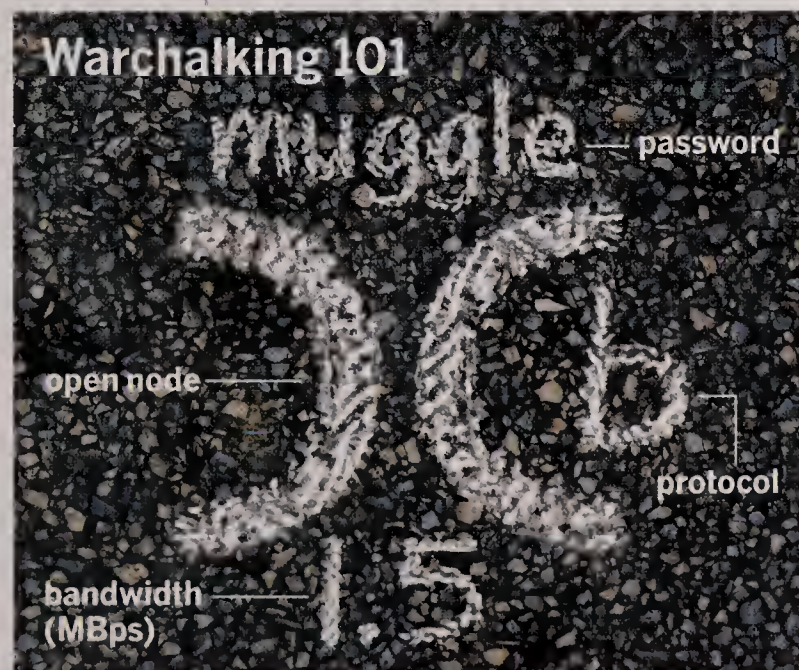
NOT MANY OF US HAVE had firsthand experience with the symbols that hobos used during the Depression to let each other know where a free bed or meal would be available. But Matt Jones, a British Internet product designer, resurrected those secret signs and used their basic idea to come up with a new iconography called warchalking—for use by wireless hobos.

Like the hobo signs of

yore, these symbols, drawn with chalk on sidewalks or buildings, also alert passersby. But this time the goal is not food or shelter—it's Wi-Fi broadband access. And although the genesis of warchalking arose from the Internet-inspired "free information for all" concept—with owners of short-range 802.11b or Wi-Fi standards alerting those in need of access points—the idea could take on very sinister forms if your company is warchalked and nonregistered users use your network to get on the Internet. Cell phone manufacturer Nokia has termed warchalking theft. And it's not in good stead with the FBI either, which warns that unscrupulous piggybackers cannot only slow your systems down, they could use your network to issue spam.

Despite its detractors, warchalking, which Jones first posted to the Web last June, looks likely to mature in the coming months. For example, the CIO for the state of Utah is interested in using warchalking to alert 22,000 state employees to the existence of wireless networks in state office buildings and conference rooms. So far, most sightings have been in Britain (warchalking's birthplace), New York and Seattle. Don't be surprised if the symbols soon find their way to a patch of pavement near you.

—Janice Brand



LASERS

11. Hair-Raising Technology

IN THE WAR AGAINST baldness, weapons run the gamut—from spray paint and toupees to transplants and hormone-based drugs. Now the follically challenged can add laser technology to their arsenal.

Lexington International in Boca Raton, Fla., is conducting clinical trials on its HairMax LaserComb (www.hairmax.com). The handheld device uses low-level laser technology to awaken dormant hair follicles, reportedly sans side effects.

According to Lexington's medical director, Dr. Martin Unger, the LaserComb complies with the Food and

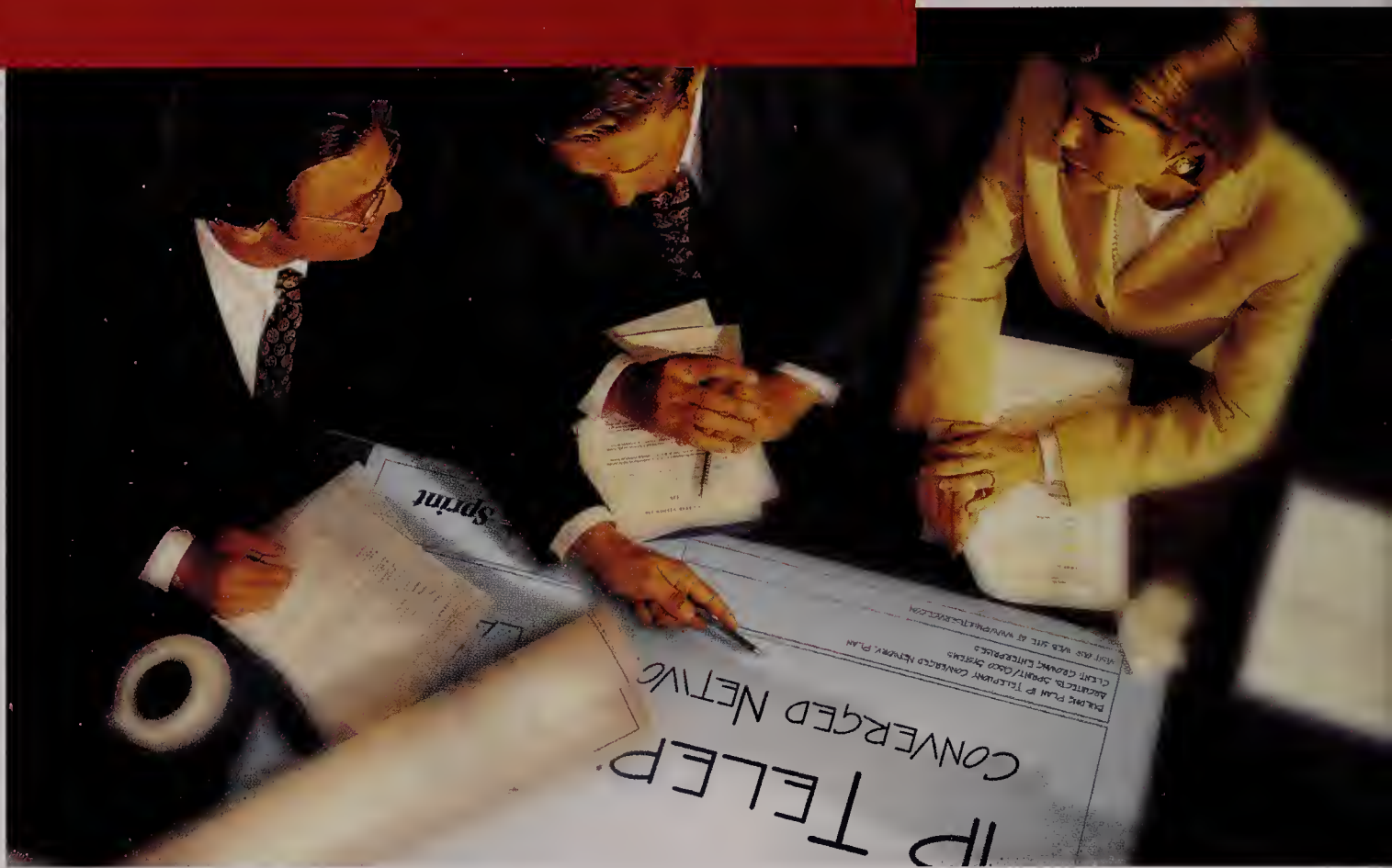
The hair-inducing LaserComb wants to go where no comb has gone before.

Drug Administration's safety standards for cosmetic devices and is now available online for \$645. The current trials are designed to add teeth to the LaserComb's boast that it will stop hair loss, regrow hair and improve scalp tissue.

Unger says results from a previous study involving men and women were promising. "In excess of 80 percent of patients significantly increased the amount of hair they had," he says. He also claims that preliminary results from the FDA trials are in that same ballpark. Unger expects the FDA's final results to be in by the end of 2003 and, if they're positive, the LaserComb hopes to bring about a new era of hair today, hair tomorrow.

—Megan Santosus

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How RFID Works: A Soda Story



RFID

12. Bar Codes on Steroids

RADIO FREQUENCY identification (RFID) tags are like bar codes on steroids; they're to traditional SKUs what Robocop was to your ordinary cop on the beat.

RFID tags are already here but ubiquitous RFID is still a work in progress.

Here's how RFID works. Labels, or RFID tags, containing microchips are attached to products, or more likely to cases of products. The chips are then read by a device that identifies the product inside the case. There are two types of tags: passive tags that are identified by an RFID reader; and battery-powered active tags that emit a constant signal. RFID readers do not require line-of-sight access to the tags; that feature promises to revolutionize the way warehouses will be run.

Furthermore, a company could (and someday will) track a product from creation through the sale process, all the way to the point of consumption. That, in turn, will bring us those smart refrigerators ("You need milk") and medicine

cabinets ("Time to renew your Paxil prescription") you've heard about.

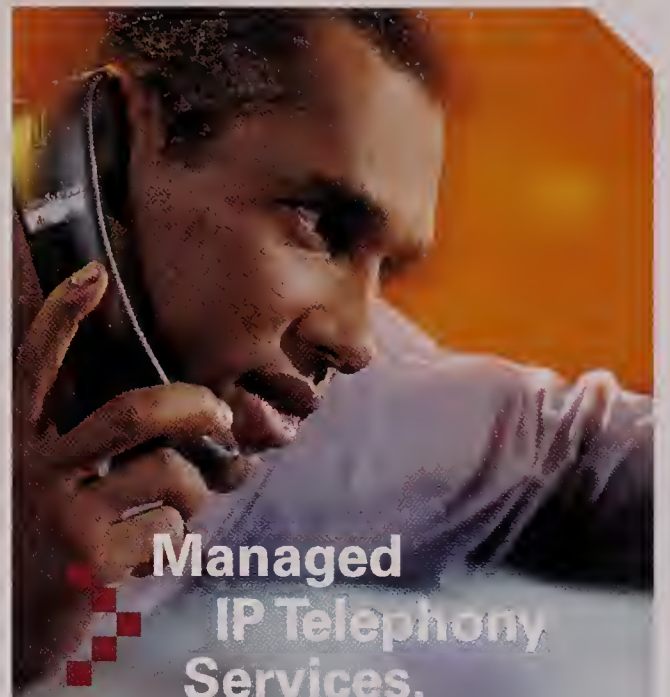
Of course, that's all decades in the future. (The bar code, by way of comparison, was patented in 1952 and took nearly 40 years to arrive at your local supermarket.) The immediate problem is cost. Even the cheapest RFID tags today run about 40 cents a pop—more than many of the products to which they could be attached.

The price will eventually come down, but Forrester Research analyst Christine Overby says that right now it's a chicken-and-egg scenario: Companies can't afford to buy RFID tags in bulk, and manufacturers can't make them cheaper until they do.

Today's RFID ROI comes from warehouse management efficiencies, but there will be a huge first-mover advantage for the company that figures out how to incorporate RFID and all the information it can contribute to its data systems into its business, says Gartner senior analyst Jeff Woods. CIOs should start thinking about that today. But what does 2003 really hold for RFID?

"More talk," says Woods.

—Ben Worthen



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The Magazine for
Information Executives

As information technology permeates all areas of the business, CIOs have found that they are expected to be much more than technology experts. They need to be leaders, motivators, communicators, educators and collaborators. They need to work within the organization's ethics, values and culture, navigate the politics, set realistic expectations. They need to establish themselves as trusted partners throughout the organization. And yes — they still need to keep current with technologies that will significantly impact the business.

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The CIO role has evolved dramatically over the past several years; the nature of the job is more complex than ever – and the tough economic climate necessitates keeping an ever-vigilant eye on bottom-line pressures. CIOs increasingly have more of a hand in defining and driving corporate business strategy. And everyone – business line managers, the executive management team, the CEO, the Board of Directors – has greater expectations of their CIO. What are the essential skills and attributes needed to thrive in the CIO role today? Charlie Feld talks about his own experiences over time as CIO of very diverse businesses, and what his client companies demand today as they look to the CIO's organization to continually help transform the company.

Developing the Next Generation of IT Leaders

Rick Swanborg, President, ICEX



In addition to honing their own leadership abilities, CIOs are concerned with identifying and developing effective leaders in their organizations. How do you train the technical staff to better understand and communicate with the business side? How do you pick the person to spearhead a key initiative? How do you effectively delegate responsibility? Swanborg and a panel of CIOs discuss the challenges involved, and share the techniques they've used to mold the next generation of IT leaders.

What Every CIO Should Know About Digital Rights Management

Jonathan Zittrain, Conference Moderator & Co-founder, The Berkman Center for Internet & Society, Harvard Law School



Entertainment companies aren't the only ones with digital content worth safekeeping. More companies now are realizing the potential threats and are seriously weighing the risks of not implementing digital rights management (DRM) technologies. These technologies can leverage your work if you produce content – and confound it if you consume it. They are infusing everything from video to text. Zittrain explores recent trends in DRM deployment, and discusses the impact on businesses of all types.

Best Practices for Evaluating Hot New Technologies

Martha Heller, Director, CIO Magazine's Best Practice Exchange



It's the universal problem for CIOs: hot new technologies confront you daily and you need to make the decision to adopt or ignore every single time. If you hop on the hype, you could risk millions – along with your reputation – but if you hang back and wait, you could miss the boat. This panel of CIOs, drawn from the CIO Best Practice Exchange, CIO Magazine's private online network of senior IT executives, offers practical advice for evaluating the "next best thing."

Plus:

The CIO Interview with Editor in Chief Abbie Lundberg

How to Avoid the IT End Run

Effective Board Membership

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fly-fishing lessons. Take advantage of the European spa and fitness center, and the extensive Camp Hyatt program for kids. Find great designer bargains at over 100 stores in the Miromar Outlets.



TRANSPORTATION

13. Segway May Get Last Laugh Yet

SINCE ITS MUCH-HYPED UNVEILING on *Good Morning America* on Dec. 3, 2001, the Segway Human Transporter (HT) has been met with both acclaim and disdain. After 11 months of speculation about what "It" or "Ginger" (as the promised invention was variously code-named) could be (Silicon Valley luminaries John Doerr and Andy Grove even suggested that "It" might be bigger than the PC or the Internet), America was expecting something truly grandiose.

What America got was a high-tech scooter. But the HT—with its 10 microchips, five solid-state gyroscopes (the same ones found in cruise missiles) and two tilt sensors that work together to intuit subtle shifts in a rider's weight—was, in fact, a bit more. And people who've had a chance to take it for a self-balancing spin unanimously report that it is, in fact, pretty remarkable.

Among the handful of organizations that have purchased HTs are the United States Post Office, Disney Cruise Lines, New York State Electric & Gas (NYSEG) and construction company Walbridge Aldinger. (Consumer versions of the device will emerge from the lab in 2003, says a Segway spokesperson.) Those and other companies that have tested but not yet purchased HTs are looking to the vehicle to improve productivity and to mitigate the strain on employees who do a lot of on-the-job perambulating. Mike Wales, a safety engineer for Walbridge Aldinger, says that by using an HT he can often inspect his portion of a construction site two to three times more frequently than he can on foot. During initial tests of the HTs, GE Plastics also saw the potential for double-digit productivity gains among environmental health and safety engineers and

maintenance and security staff in its plants.

Over the next year, more companies plan to test the HT. (One recent morning in Segway's Manchester, N.H., headquarters, two men from transportation and logistics company Bax Global were there to investigate the HT.) Observers speculate that if the HT takes off anywhere, it will be in industrial settings, in part because the company is battling with legislators about its sidewalk safety. Segway is planning to offer HTs customized with canvas bags for different industrial uses, and the company also expects to build HTs that somehow shelter riders who spend much of their workday outdoors, such as NYSEG meter readers.

But if HTs themselves don't catch on, the technology that makes them work is likely to find a home elsewhere. When the idea of putting the gyroscopic guts of an HT in a motorcycle was suggested to William Gray, a Delphi Delco power train executive, he said he had heard other people in the automotive industry discuss that possibility. Tobe Cohen, a spokesman for Segway, wouldn't comment, but if you think about the money Segway could make from selling its patents, you might find the HT, and its attendant hoopla, considerably less comical.

—Meridith Levinson



A Tampa, Fla., mail carrier zooms along his route on the Segway Human Transporter. Companies are looking at the scooter as a productivity tool.

MONIKA HENZINGER ON ALGORITHMS

14. Still Searching (After All These Years)

MONIKA HENZINGER, born in Bavaria, Germany, enrolled at Germany's University of Saarbrücken in 1985 and promptly fell in love. The object of her affection was an arcane branch of computer science. "As an undergrad, I fell in love with the efficient algorithm," Henzinger says enthusiastically. "This was something elegant and fun. I have always liked solving problems, and finally I had found my true calling."

Henzinger, now 36, went on to earn her doctorate in computer science from Princeton University. But it was while teaching courses on her beloved algorithms at Cornell University when she had a flash. "I realized that efficient algorithms were fun but not very useful to the world anymore," she says. Soon after, she left the academy and turned her attention to something that would be: Web search technology. Now, as

director of research for Google, the Web's hottest search engine, Henzinger stands at the cutting edge of what many consider the Web's most useful technology.

Her colleagues in the tight-knit field of Web search technology consider Henzinger a pioneer.

"Monika was involved in Web search research from the start, even before Google was founded," says Bay-Wei Chang, a senior research scientist at Google. "She comes up with great ideas and then goes off and thinks them through."

Henzinger traces her early interest in math and science to a magazine article on the Martian atmosphere. "I thought that was the coolest thing in the world," she

says. Thereafter, math and physics teachers gave her problems to work on outside of class. Her career goal at the time? Mission specialist on a space shuttle.

Years later, her feet firmly planted in Silicon Valley, Henzinger turned her attention to Web information retrieval research at the Digital Systems Research Center in Palo Alto, Calif. There, she met two Stanford grad students whose research piqued her interest. Instead of ranking webpages by how many times a key word appears (as other search engines do), they chose to rank them by the popularity and relevance of each page according to the Web's vast link structure. For example, they interpreted a link from page A to page B as a vote by

page A for page B. The more votes, the higher the ranking. These two students, Sergey Brin and Larry Page, went on to found Google in 1998, and a year later Henzinger started up the company's research department. Google now processes more than 150 million searches a day, or about 1,800 searches a second, in 74 languages in 32 countries. Henzinger's algorithms have a lot to do with that success.

"If you think Google is fast, it's because we have good algorithms," says Henzinger, sitting in a conference room in Google's cramped Mountain View, Calif., headquarters. Such good algorithms, in fact, that Yahoo pays Google \$7 million a year to use them and America Online tapped Google to

$$\text{PageRank}(u) = (1-\epsilon) \sum_{(v,u) \in E} \text{PageRank}(v) / \text{outdegree}(v) + \epsilon/n$$

ϵ is a constant

n is the # of nodes in the graph $G(V, E)$

u, v are nodes

$\text{outdegree}(v)$ is the # of edges leaving v



Monika Henzinger, director of research at Google and a pioneer in search technology, in front of her Page Rank algorithm.

be its exclusive search engine last May.

The wife of an Austrian-born professor, who teaches computer science at the University of California at Berkeley, and the mother of two girls, ages 4 and 1, Henzinger typically rises at 5 a.m. to run experiments from her Menlo Park, Calif., home before her family is awake. She leaves work every day by 5:30 p.m. to pick up her daughters from day care and is in bed shortly after the girls' 8 o'clock bedtime. At work, she shares her office with two other researchers, using a Linux workstation among piles of books on natural language processing.

Google prides itself on fairness; companies can't rig the system to come out on top. But people still try to fool the ranking algorithm and some succeed. Henzinger is currently at work on a way to outsmart the hackers. "I'm thinking of an algorithmic way of doing this," Henzinger says. Evidently, first loves die hard.

—Susannah Patton

LOCATION SERVICES

15. GPS Finds New Business

USING A GLOBAL POSITIONING system to pinpoint your location—or that of your employees, vehicles or even buildings—on the world map isn't tough. Just trot down to the local sporting goods store, and you can have a GPS for \$150 or less. Getting that GPS to integrate wirelessly with your back-end applications, however, requires considerably more work—and money. But soon, taking advantage of those same GPS features that can help a lost hiker get out of the woods could be as easy as paying a few extra dollars on your cell phone bills.

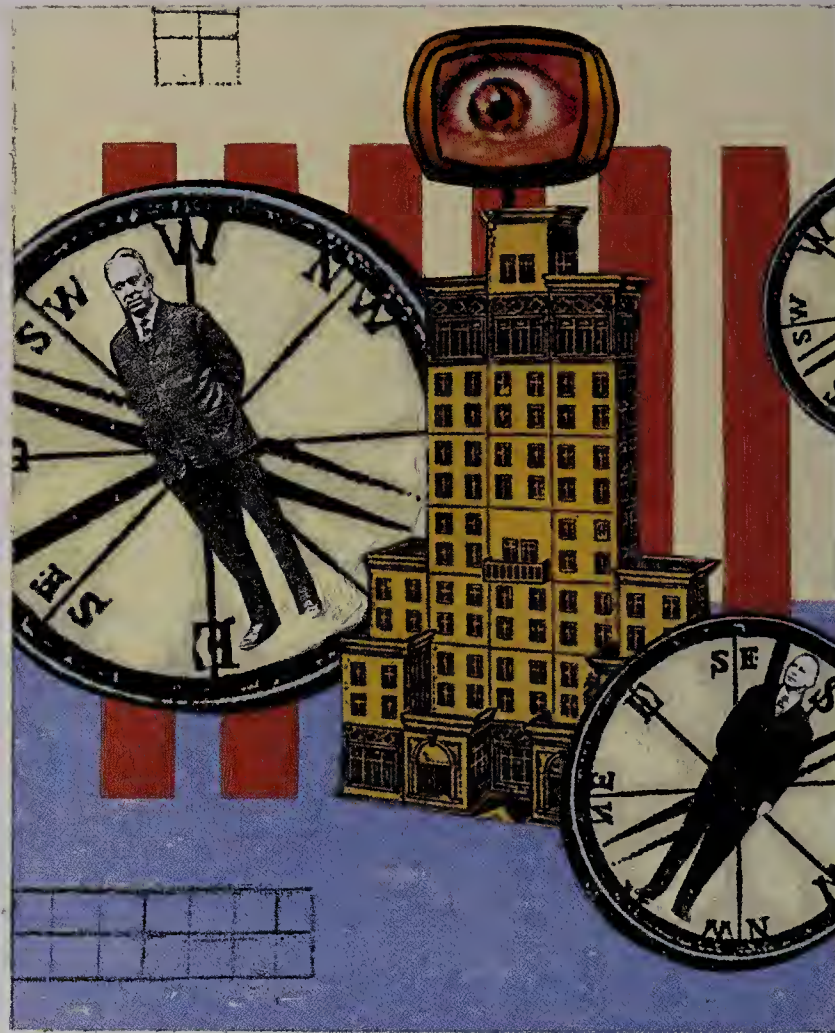
Cell phone carriers are creating the federally mandated Enhanced 911, or E911, system that will let emergency workers (and criminal investigators) identify the location of new GPS-ready cell phones. The technology behind that same system

will also let the carriers provide relatively low-cost, easy-to-deploy location-based services. The benefits of these services to companies—such as improved customer service, faster response times and more efficient deployment—may be great, but the implementation hassles (such as having to buy dedicated GPS hardware and special software and perform custom integration work) have tended to relegate such services to big logistics companies and huge field-service organizations.

Greg Santoro, vice president for Internet and wireless services at Nextel, says the new GPS technology will allow his company to offer applications like a Web-based dispatch service that could be up and running in a day or two using the employees' existing cell phones. Such services would be inexpensive enough even for a small landscaper or plumbing supply house. Large companies could find themselves in a stronger position to argue the ROI of a system that uses cell phones that the company already owns combined with software managed by a known provider—the cellular carrier.

Bob Elfanbaum, CEO at wireless systems management software provider Asynchrony.com in St. Louis, says some customers are interested in GPS-based services. One, a large insurance provider, which he declines to name, envisions multiple scenarios for using GPS information. "Think of a hailstorm over a large area with a lot of crops," Elfanbaum says. "You could just walk the field and transmit the coordinates of crop damage." And you could do it without buying dedicated hardware for every insurance agent.

Despite the obvious benefits, there are



still hurdles in the way of mass GPS service adoption. Santoro notes that carriers have to meet the Federal Communications Commission's E911 mandate before offering commercial services, which will postpone the introduction of such services at least until the first quarter of 2003. Then both companies, the wireless carriers and the government will have to address privacy concerns. How will employees react when their every movement—whether it be running across town to their favorite lunch spot or stopping at a competitor's office to drop off a résumé—could be monitored by the boss? And how does one guarantee that the same system that gets an ambulance to you after a car accident won't be used by the government to track your movements overseas?

None of the questions should be deal-breakers, however. The power of GPS services is too strong to ignore. "This is not Buck Rogers-type technology," says Bob Hartwig, chief economist for the Insurance Information Institute in New York City. "I think it's really here."

—Christopher Lindquist

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OPEN SOURCE

16. Linux Scales New Heights

IN A COMMODITY MARKET, the cheapest producer always wins. In the partially commodified market of software, the cheapest producer isn't a software company, it's a movement: open source, developed by the mostly anonymous group of software hackers who do their work for free and collaborate in a cheap meeting room—the Internet.

A for-profit software company cannot compete with the economics of open source—free is as cheap as it gets. Nor, it turns out, can it compete with open source's quality testing process. Though the pace of open-source development can be languid and tends to create products less functionally rich than their proprietary counterparts, the stuff gets tested so often and so brutally by so many different people that most open-source programs are judged to be more stable and reliable. In a commodity market, low cost and reliability count more than bells and whistles.

The question for CIOs in 2003 is, Which pieces of the corporate software architecture will become commodities, ripe for replacement by open source? The operating system for website servers is already there—the open-source Apache program has 70 percent of the market. Other areas will follow as proprietary software hits a development dead spot and stops changing—word processing, for example, or, some would argue, the PC operating system, though Microsoft says it still has many more tricks up its sleeve to make PCs run better.

To Matthew Szulik, CEO of Red Hat, the Raleigh, N.C.-based distributor of the

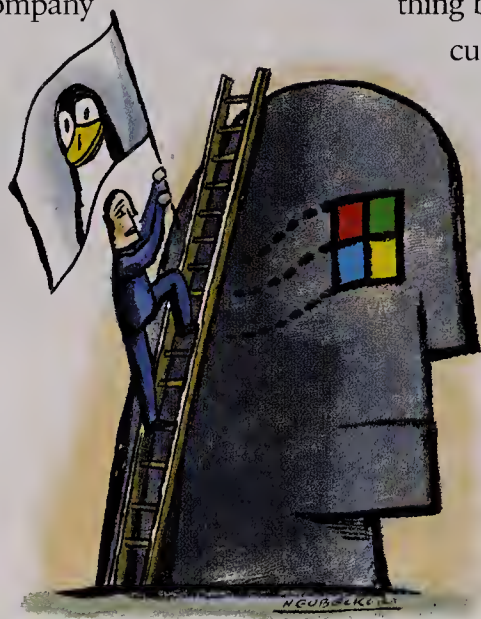
open-source GNU/Linux operating system, commodification will go much higher in the software food chain than even PC operating systems. “We get business plans from companies all the time saying, ‘We can deliver [complete] open-source software platforms for particular vertical industries,’” he says.

The creeping legitimacy of open source was given a big boost in 2002 when major vendors including IBM, Oracle and Sun Microsystems pledged support. On the surface, it seems like the vendors are just thumbing their nose at Microsoft. But something big is at stake here. By offering customized services for open-source software, vendors stand to lock in customers on service—a much more lucrative market than software licenses. A retail CIO, who did not want to be identified, explains: “If I buy Windows, I may use IBM to maintain my infrastructure or I might not. But if I hire IBM to retail-harden open-source software and support it, I'm much more likely to stay with them.”

Small, startup GNU/Linux vendors like Red Hat have not had the muscle to offer that kind of service to vertical industries, so big-company CIOs stayed away in droves.

With the support of those major vendors behind open source, 2003 will be a turning point in the software's viability as a cheap alternative to proprietary systems. The retail CIO has 20,000 cash registers that are essentially PCs with Windows operating systems. They could all be replaced with GNU/Linux as early as 2004, he says. In retail, and likely in other industries that deploy thousands of PCs as terminals, a big wave of open-source pilots will occur in 2003, followed by deployment in 2004, he predicts, adding that “CIOs are saying, I just can't live with [the cost of proprietary software] long-term.”

—Christopher Koch



OUTSOURCING

17. Passages Beyond India

INDIA HAS LONG BEEN THE leader in off-shore IT outsourcing, with a \$4 billion IT services export industry, a decade of lead time over most other countries and upward of 80 percent of the offshore market. The rising demand for those services and increasing risk of terrorist attacks are prompting CIOs who source work abroad to look beyond the usual suspects. “It's just not a good idea to have all of your eggs in one basket anymore,” says Marty McCaffrey, executive director of Salinas, Calif.-based Software Outsourcing Research.

In 2003, CIOs looking to outsource can expect to get solicitations from places like Bangladesh or Bulgaria. In reality, most countries are far behind India, which boasts 900 software companies employing 415,000 professionals and more software quality initiatives than even the United States. But there are three up-and-comers that are worth a look.

CHINA: SIZE MATTERS

With a population 1.3 billion strong, a solid educational system that emphasizes technology and an average programmer salary of less than \$9,000 a year, it's not surprising that China is a contender in the outsourcing world. What *may* be surprising is that the Chinese government, after years of trade policies that hampered IT

CHINA



development efforts, is setting up software parks and offering tax breaks to fertilize its growing IT services sector.

But a lack of English language skills and myriad cultural differences with the United States now prevent gargantuan growth in U.S. contracts heading east. And big multinational companies that are setting up shop there, such as IBM and Nortel Networks, are gobbling up some of the top talent. Nonetheless, with the government pushing English skills and promoting local entrepreneurial zeal, some predict China could surpass India in its IT services export market within the next decade.

RUSSIA: ROCKET SCIENTISTS AT WORK

Russia's large supply of talented technology pros includes rocket scientists laid off by the government working for an average salary of just \$5,000 to \$7,500. And the IT services market there (centered around the cities of Moscow, St. Petersburg and Novosibirsk) has been growing at a clip of around 40 percent to 60 percent per year. Like India, Russia established an agency, the National Software Development Association, to foster continued growth.

Though most of Russia's 100 IT services companies are tiny and untested, a handful of big companies dominate the industry, the largest being Moscow-based Luxoft, which has embraced software certification and courted such notable U.S. companies as Boeing, Citibank and Dell. Away from the five biggest companies, solid English skills are scarce and project management ideas are shunned. McCaffrey says Russia

has a big IT talent pool, but many there "refuse to realize the importance of learning English and having experienced project managers, and that holds them back." An erratic government and unstable economy don't help either.

Nonetheless, Gartner estimates that by 2007, Russia will have captured a 5 percent market share of offshore services revenue in North America and Western Europe.

THE PHILIPPINES: ENGLISH SPOKEN HERE

Under U.S. rule for nearly 50 years, the Philippines is the most culturally compatible with America of the three outsourcing destinations highlighted here. English fluency explains the Philippines' popularity as a source of call center operations. The country has been a strong source of programming skills for more than 20 years, and the IT infrastructure there (originally put in place by the U.S. military) is solid.

"I'm a huge fan of the Philippines," says William Lewis, senior international liaison at Dayton, Ohio-based LexisNexis. "There are great values to be had there and a growing offering of software services. And the highly Westernized culture makes it very attractive to those with less offshore experience."

The Philippines probably won't surpass India in software development outsourcing. Other outsourcing areas—business process outsourcing and contact centers—in which India is not dominant and China and Russia have little chance could become this nation's domain.

—Stephanie Overby



CREMATION TECHNOLOGY

18. Diamonds (And Grandma) Are Forever

LOOKING FOR A NOVEL WAY to spend eternity? Consider LifeGem, a Chicago company that will turn your ashes into diamonds. Ocean lovers might prefer Eternal Reefs, a Decatur, Ga., company that mixes ashes into concrete to make artificial coral reefs that are dropped into the sea. Then there's Celebrate Life, of Lakeside, Calif., which will scatter your remains in a fireworks display. In fact, when it comes to innovative ways to use cremated remains, the sky is not the limit. Houston's Celestis has already blasted the remains of about 100 people into space, including *Star Trek* creator Gene Roddenberry.

"People are looking to personalize the cremation process, and there are many more ways to do that now," says David Walkinshaw, a spokesman for the National Funeral Directors Association in Brookfield, Wis. The trend mirrors the growing popularity of cremation. According to the Cremation Association of America, 25 percent of Americans are cremated when they die, a number expected to double by 2050.

While mixing ashes with concrete is no

RUSSIA

PHILIPPINES



Ideas 2003

technological feat, turning them into diamonds is a bit trickier. Normally, carbon leaves the body in the form of carbon dioxide during the cremation process, says Mark Bouffard, a LifeGem spokesman. But a patented process that manipulates the oxygen level in the cremation oven allows the carbon to remain. Then, the carbon is collected, heated in a vacuum until it becomes pure graphite, and sent to a lab where a gem is created in six to eight weeks instead of the usual several million years.

So far, LifeGem has made a batch of colored diamonds from a deceased pig. The first diamonds made from human remains will be ready by early 2003 and sold at prices ranging from \$4,000 for a quarter-carat blue diamond to more than \$27,950 for a 1.25-carat red gem. The diamonds are naturally light blue, but LifeGem is also creating red and yellow ones by removing boron and adding color to the gems. And the diamond owners won't have to worry about misplacing all that remains of Grandma or Grandpa. "Each person has enough carbon to make 50 to 100 life gems," Bouffard says. "We'll store the remaining carbon just in case."

—Susannah Patton

GADGETS

19. Beyond Pokémon

IF IT'S ON THE KIDS IN Japan now, it'll be in the mall in Sheboygan soon enough. Japanese kids are the earliest of early adopters of tech gadgetry that goes beyond the merely playful. Wouldn't it be nice to outfit the sales department in wearable PCs? Or, on your next business trip, remember your watch and leave the cell phone at home? Here's a selection of what the Japanese kids are using—and what you'll be hearing more about in 2003.

CAMERA PHONE. Single-handedly helping to stop Japan's mobile phone popularity slide is the appearance of a phone that can take a picture too. Now it's come to these shores. Sanyo has teamed up with Sprint to offer the first U.S. phone with a built-in camera that can take 640x480 photos, zoom up to 16x, and control brightness, balance and tone. Oh, yeah, it's got voice dialing, an electronic organizer and a built-in answering machine too. The perfect thing for those who've run out of anything to say. **Sanyo SCP-5300, www.sanyo.com**
About \$400

WEARABLE PC. The hard drive, a mere 11 ounces, slips into a pocket. The mouse fits into the palm of the hand. And as long as you don't mind being mistaken for a *Star Trek* villain, the headband-mounted display (a single bulging eye socket) makes you feel like the monitor is a comfortable 2 feet in front of you. The Xybernaut Poma isn't exactly wireless, but it beats looking at a puny PDA screen or lugging around a laptop all day. It's got 32MB of memory, a Windows CE operating system and a Compact Flash slot. Early user reviews suggest giving the Poma a year to mature, which should make it ripe in 2003. **Xybernaut Poma www.xybernaut.com**
About \$1,500

MD PLAYER. In Japan, the MD, or MiniDisc, rules when it comes to music. Why? The MD is a magneto-optical recording on a cartridge-enclosed 64-millimeter disc; that is, it's sort of a cross between a cassette and a CD, offering the endless rerecording capabilities of the former and the quality sound of the latter. This portable player runs on a chargeable NiMH battery and one AA-size battery, which, together, provide 193 hours of playing.

Panasonic SJ-MJ15
www.minidisc.org
About \$200



WATCH + PHONE. Dick Tracy, phone home. You can too with this under-50-gram "wireless terminal." And just like the detective's 1946 original, the unit is voice-activated. Its battery delivers 90 minutes of talk time, comes with headphones and an easy-to-read LCD display for the menu. Perfect for keeping in touch with your own Tess Trueheart or battling your version of arch-enemy Pruneface. **Samsung Watch Phone SPH-S100 www.samsungelectronics.com**
About \$98 —Janice Brand





To me, success is a 35 minute lunch.

At a restaurant, not my desk.

Means I'm not wasting time doing the
same data management task again and
again and again and...well, you get it.

Save the day.



V2X Subsystem

Consolidate your work by consolidating data from all your different systems. One way is with a V2X Shared Virtual Array subsystem and SnapVantage software to unite all your Linux virtual servers. Or an L5500 automated tape library and T9940B tape drive. There are other ways, too. We'll help find the one that's best. So storage administration takes a smaller bite out of your day. Learn more about this story and other ways we can help you at www.savetheday.com

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SOFTWARE DEVELOPMENT

20. Jack, Be Quick

LAST MARCH, Jerzy Dutkiewicz, manager of architecture and integration at a Fortune 500 energy company, attended a conference on an ascendant software development methodology known as agile programming, hyped as the solution to all software development ills.

The agile method encourages programmers to work on a single piece of code together—at one computer—to foster face-to-face feedback. It also insists that IT and business users jointly spec out an application's features and functionality. (For more on agile development, see "The Secret to Software Success," www.cio.com/printlinks.)

Dutkiewicz listened and left unconvinced. Despite all the consultants' enthusiasm and talk of limiting project scope and function creep, he wondered if the methodology was just an excuse for consultants to deliver unfinished or inadequate products to clients.

Dutkiewicz isn't the only skeptic. For agile programming to gain ground and credibility in 2003, the cheers have to come from IT executives who've had success with it in their organization.

The cheers are starting to come.

Tom DePauw, CIO at Caterpillar Financial Services in Nashville, Tenn., and Stephen Levy, Standard & Poor's vice president of global applications development, have been using agile methodologies for a few years, and they say their applications are working just fine, thank you.

To develop Cat FinancExpress, a Web-based system that automates many of Caterpillar's equipment finance processes, DePauw's team used several components of agile development. It deployed the application incrementally. And it developed the



most valuable features of the application first, in short development cycles, which it then delivered to business users in order to get feedback on what it had produced.

"[Agile] allows you to change the [development] process as the business needs change," says DePauw. "If you get an application into the hands of users, you'll quickly learn what needs to be added or modified to make it more usable."

Levy uses agile methodologies to create sets of software and Web services that can be assembled and reassembled into different products such as Ratings Direct, an online source of Standard & Poor's global credit ratings. His development staff does weekly and biweekly builds of software, which they then have users test for bugs and functionality. They use the storyboard technique on client-facing systems.

"We've been able to deliver higher quality products in a shorter amount of time," says Levy.

—Meridith Levinson

BUSINESS ETHICS

21. Book 'Em

ONE OF THE MORE POPULAR business books in recent years is titled *First, Break All the Rules*. Executives at Adelphia, Enron, Tyco and WorldCom may have taken that advice too literally.

Forthcoming offerings from business publishers seem to reflect the shift in the zeitgeist for 2003. For January releases alone, new books will include *An Introduction to Business Ethics*, by Joseph R. Desjardins, and *A Primer on Business Ethics*, by Tibor R. MacHan and James E. Chesher. For those already in deep trouble, another January offering is *Street-Smart Ethics: Keeping Your Job Without Going to Jail*, by Clinton W. McLemore. In February, look for an ethics title that should have particular appeal to CIOs: *The Ethics of Information Technology and Business*,

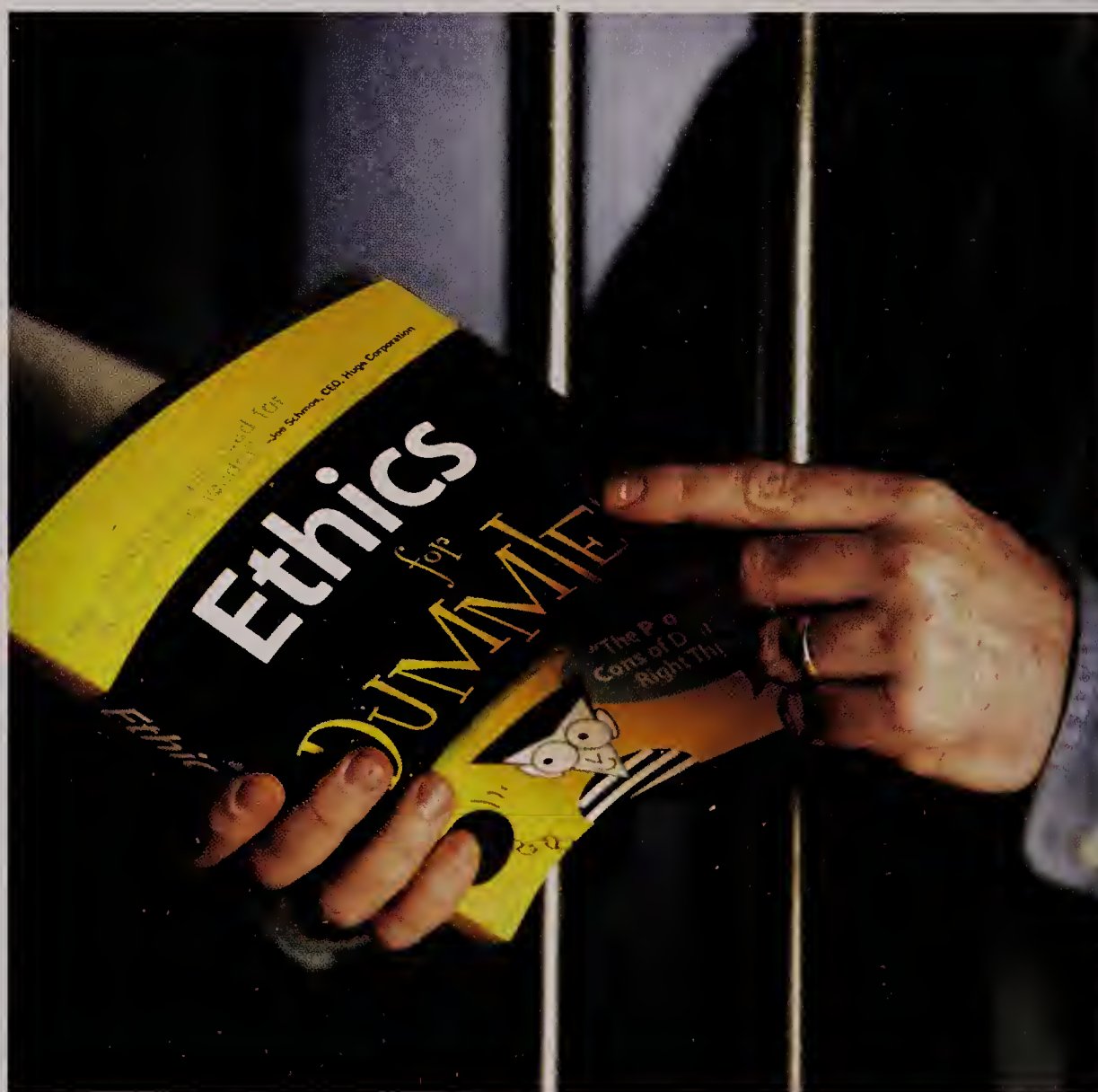


ILLUSTRATION TOP BY MARC ROSENTHAL; PHOTO BOTTOM BY STEPHEN WEBSTER

BUSINESS TRIVIA QUESTION

Number 19

VeriSign processes over
\$3.7 billion in payment transactions
per quarter.

☐ True?

or

☐ True?

It may also be news to you that VeriSign handles e-commerce payments for some 80,000 different businesses and protects more than 400,000 websites. You see, VeriSign has spent the last seven years building a secure infrastructure for the Internet. We'd like to do the same for your business. VeriSign can help you deploy a trusted infrastructure so you can conduct secure communications and transactions. So no matter how many e-commerce payments your company handles, you'll know every last one of them is secure.

Learn all you need to know about infrastructure security – and how VeriSign's managed network and security solutions can help you – by downloading our new white paper: *Cyber Security in the Age of Action*. Visit www.verisign.com/security



■ PAYMENT SERVICES ■ TELECOMMUNICATION SERVICES ■
■ NETWORK AND SECURITY SERVICES ■ WEB IDENTITY SERVICES ■

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by Richard T. DeGeorge.

While it's tempting to attribute this concentration of business ethics books to recent events, that's misleading, says Dominick Anfuso, editorial director of The Free Press, a New York City-based imprint of Simon & Schuster that publishes business titles. The long lead time in publishing means those books were in the works long before the recent accounting scandals became public. Business ethics "has always been an important subject," he says. Apparently the advice in such books has been overwhelmed by the pressure for profits and short-term results.

Anfuso hopes the new crop of books—which includes his own company's January entry, *The Trusted Leader*, by Robert M. Galford and Anne Seibold Drapeau—will get a boost in sales from the current scandals, but he's not holding his breath. "We'll all put [ethics books] out and hope that something will take hold," he says.

Then Anfuso hits on a potential best-seller on business ethics: "It would be great to have a prominent figure, a businessperson, write a book about ethics instead of his life story." Instead of Welch's *Jack: Straight from the Gut*, perhaps something along the lines of Twain's *The Man That Corrupted Hadleyburg*?

—Edward Prewitt

DAN GEER ON SECURITY

22. Life with Everyone Watching

ASK DAN GEER a question about something—privacy, for instance—and he walks straight through the topic and out its back door before even beginning his answer. The answer, when it comes, arrives deceptively from what appears to be a very great distance, some weird nether alley or off-premises parking lot. Eventually, the ques-

tioner starts to lose track of what the question was—perhaps when Geer is drawing a set of thick blue axes on a whiteboard, the vertical one labeled "people" and the horizontal one labeled "permissions."

Geer, who is CTO of @Stake, a security consultancy based in Cambridge, Mass., is trained as a biostatistician. In statistics, numbers exist to give validating shape and mass to the sort of reckonings—the likelihood, say, of a 100-year flood occurring *this* year—that the nonnumerical among us simply can't get our minds around. As CTO, he mainly applies his training to working on the large problem of digital security risks, and their mitigation, on behalf of @Stake's clients.

"Complexity is the chief enemy of security," says Geer, beginning his leisurely stroll. "Any solution in the name of security that increases complexity is asking for trouble.... Security solutions must be simple or they will be unsustainable [because] security's accumulating costs will *grow* in visibility while security's deliverables will shrink in visibility." In other words, the more successful investments are at preventing attacks, the less obvious the benefits of those investments will appear to be.

Geer argues that the traditional access-control model of creating elaborate permission-granting systems—with passwords, tokens or biometrics—is headed toward kaput because the volume of information to which access must be granted is growing rampantly (as the cost of collecting it is dropping dramatically), and because the roles and associated rights of individuals entitled to some sort of access are becoming so variable (demanding exceptional flexibility). That requires an elaborate architecture and high administrative and IT overhead so that the cost, complexity and processing burden of administering access are growing geometrically. "In the long term," says Geer, "you arrive at a point of diseconomy....

"Now, yes, I'm passionate about privacy. But I'm also a realist." *Privacy?* The questioner snaps back from a far, far corner of the parking lot to recall the original

Dan Geer, CTO of security vendor @Stake, thinks that the expense of password-based security systems may lead to a cheaper, less-private world where everything people do is inexpensively logged and stored.

question. Incredibly, Geer has made his way back into the building....

He believes that the flawed economics of access control favor what he terms an "accountability" model of wide-scale surveillance and monitoring. As the cost of data collection approaches zero, privacy (as we have known it) approaches toast. It's easier and cheaper to monitor everything everyone does—to catch them misbehaving—than to create gargantuan schemes engineered to keep them away from information to which they have no right. (That is going to come as a mighty big shock to the legions of security-management vendors whose business is built around the permissions model.)

An accountability world, says Geer, "is a surveillance world," in which whatever one does is inexpensively logged and stored, available for analysis or for later



VOTING TECHNOLOGY

23. Forget Hanging Chads, Here Come Frozen Screens

THINGS WENT RELATIVELY smoothly in Palm Beach County, the former home of the butterfly ballot, during the mid-term elections in November. The county, the epicenter of the Al Gore-George W. Bush hanging-chad follies in 2000, installed new high-tech touch-screen machines in its polling places. The electronic casting of ballots seemingly went off without a hitch.

But elsewhere, where new voting technology was introduced (more than 200 counties nationwide put new, electronic machines in place), new polling-place problems emerged. In Florida's Broward County, improperly loaded software and incorrect ballots caused problems with 40 to 50 machines. Some poorly programmed or miscalibrated machines in Georgia resulted in the incorrect display of some ballots, while others froze up. And software glitches in 30 Maryland voting precincts caused machines to identify all voters as Democrats. It wasn't exactly the fall of 2000 all over again—most problems were quickly remedied. But then again, it wasn't exactly the

use as evidence. "You can *do* anything you like," he says, "but if you screw up badly enough, someone will find you." He cites a *New York Times* piece he read last year about the spread of street and building surveillance in England. "In fact, its main purpose may be to get people to *feel* like someone's watching them. Which ain't a whole lot different from what the church was teaching a thousand years ago: You can't hide from God, and there is ultimate justice in the end."

But the transformation of the world—from one based on managing permissions to one based on enforcing accountability—will be propelled by economic, not religious, fervor. If the invading of privacy through pervasive monitoring "is so clearly economically preferable, you'd have to make a really principled argument to say that we're not going to do that." In

this matter, Geer counts himself sadder but wiser when he invokes the British strategic retreat at the Battle of Dunkirk. Perhaps, he says, the best recourse for privacy will be to "make the fight over the misuse of gathered information" rather than the mere fact of gathering it.

"I'm not a sociologist," he says, "so I don't know where this all goes. But there is a social impact to growing up not expecting privacy, to being always under surveillance. I mean, I am certain that parents in my youth would have taken their kids out of school if they thought there were cameras in schools. Nowadays, people will take their kids out of school if there *aren't* cameras. I don't know what to say about that. But this is a privacy question, not a security question. People who say that privacy and security are one in the same are wrong."

—Lew McCreary



smooth, IT-facilitated voting future that under-the-gun election officials may have hoped for either.

After the November 2000 election, in which 4 million to 6 million votes were lost due to ballot, equipment, registration or polling-place problems, according to the CalTech/MIT Voting Technology Project, Americans cried out for new voting technology. But now it's clear that IT by itself cannot save the day.

"The most enduring visual image of November 2000 was of those election workers holding up punch cards to fluorescent lights to look for indentations and chads," says Doug Chapin, director of Electionline.org, a Washington, D.C.-based nonprofit election reform research group. "So folks targeted technology as the largest culprit and technology upgrades as the most important thing to do. But the larger lesson we take from Florida is that new machines alone don't constitute election reform."

Nonetheless, it looks like more new machines are on the way. On Oct. 4, a joint House-Senate committee agreed on a sweeping election reform bill that allocates \$3.9 billion over the next three years to help states buy new equipment, train poll workers and create computerized statewide lists of registered voters.

Sounds good, but all politics are local, and that's the level of government entity doing the purchasing and implementing of these new systems. They're historically less interested in making voting easier and more interested in speeding up the counting of ballots and reducing fraud. That in turn is what has received the most attention from the few vendors selling this voting equipment, says Stephen Ansolabehere of the CalTech/MIT Voting Technology Project. So, unless there's more emphasis on ease-of-use when new federal dollars come into play, there are likely to still be problems.

"We need to start designing machines where the emphasis is on usability," he says.

—Stephanie Overby

SOCIAL REVOLUTION

24. Just-In-Time Mobs

HOWARD RHEINGOLD FIRST got a notion of the future in Tokyo a couple of years ago. Rheingold, an author and commentator about technology's effect on society, noticed a number of pedestrians equipped with mobile phones. While it wasn't an unusual sight in itself, Rheingold saw that many people weren't talking on their phones; instead, they were using them to send and receive text messages. That got Rheingold thinking about the next great cultural shift fueled by technology, a phenomenon he calls smart mobs.

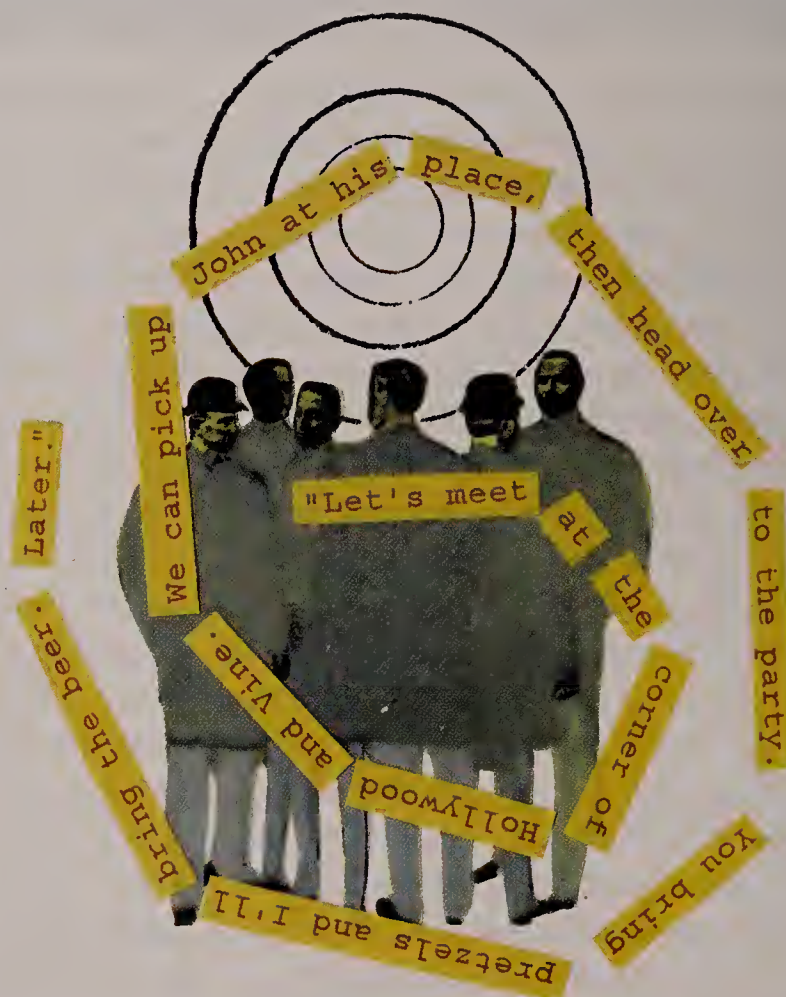
In essence, says Rheingold, smart mobs are groups of people "who use mobile devices to get information on a just-in-time basis." In addition, mobile devices will be what Rheingold terms *location aware*, meaning that groups of people can connect electronically at specific locations such as airports and restaurants.

Such groups will use information to coordinate collective action (much in the same way Filipinos used text messages to organize antigovernment demonstrations in 2001) or compare business experiences (much like eBay's current Web-based rating system). Wireless Internet access, pagers, PDAs and cell phones are among the existing technical underpinnings that will engender smart mobs. Add to that wearable computers and microchips embedded in everything from furniture to street signs, and Rheingold sees a recipe for truly pervasive computing.

The most resounding affect of pervasive computing will be social changes, contends Rheingold, who has written a book on the topic, *Smart Mobs: The Next Social Revolution* (Perseus Publishing, 2002). Look at Finland for a preview, he says. "The use of cell phones and text messages is pervasive. Already, the norms of communication in business—where the boss calls subordinates—is reversed." With applications such as instant messaging, employees on the front lines with customers can communicate with colleagues in marketing and engineering and then respond to customers. The result, says Rheingold, is more empowered employees because decisions are based on many conversations rather than dictated from the top down.

Of course, there's a real danger for people to become enslaved by technology rather than freed by it. Nevertheless, the future as Rheingold sees it is well on its way. Soon the number of mobile devices connected to the Internet will surpass wired PCs, creating an environment rife for smart mobs.

—Megan Santosus





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DATA SECURITY

25. Hidden in Plain Sight

LET'S FACE IT. It's a clunky name for an elegant concept: steganography.

Though it sounds like a creature from the Mesozoic Era, steganography describes the art of hiding messages in plain sight. The practice goes back at least as far as



There's a secret message hidden in this story. To decode it, start at the beginning and don't stop until you reach the end. Find the answer on the opposite page.

ancient Greece. Lately, though, it is gaining popularity in the digital world. Experts say some computer-born conundrums, such as file sharing, provide the perfect problem for steganography to solve.

Of course, for the practice to really take off, first it must be understood. Really, it's simple—so simple that I'm using it in this story.

Parsing the word *steganography* yields its literal meaning: *covered writing*. How literal that translation is might surprise you. Ancient Greeks practiced steganography by shaving a messenger's head, tattooing it with a secret message and then sending the messenger to his destination after his hair had grown back. Notable, too, was how Demeratus scraped the wax from a writing tablet and wrote on the

tablet that Xerxes planned to invade Sparta. After he wrote the secret message, he covered it with wax again. Next he wrote an innocent message on the tablet. Never suspecting what was hidden beneath, sentries let the tablet pass inspection. Imagine Xerxes' surprise when Sparta was waiting for him.

Effective steganography requires little more than a good imagination. Simple items like the book *Moby Dick* can be used. All you do is build a code to tell someone what words or letters to extract from the book to create a message. You could even use a grocery list. Suppose I knew that your list carried a secret message that was determined by the order in which it listed vegetables and fruits.

Determining the security of any of those techniques comes down to how clever the steganographer is. Rely on well-known tricks—such as using the first letter of every sentence in a piece of writing—and the code can easily be cracked. Insist on convoluted and complex techniques, like providing a list of street intersections where certain words appear prominently, and the message is probably safe. Nothing to it.

Keen observers will see that steganography is perfect for computers. You have, after all, plenty of places to hide stuff on PCs. Omnipresent digital media files are a good example. Usually, files like MP3s, .jpegs and .mpegs contain “noise”—layers of useless bits of information. Right inside the noise layer, it's relatively easy to insert a message. One other benefit is that the file isn't damaged or disabled in any way by inserting the message.

Virtually any media file can carry a message and appear so innocuous that no one will know—which is why the entertainment industry has taken notice. After failing at every turn to stop illegal file sharing, music and movie companies believe they can use steganography to embed copyright information. Little digital watermarks could be placed in the noise of such files.

“These hidden messages will announce to the world the copyright restrictions

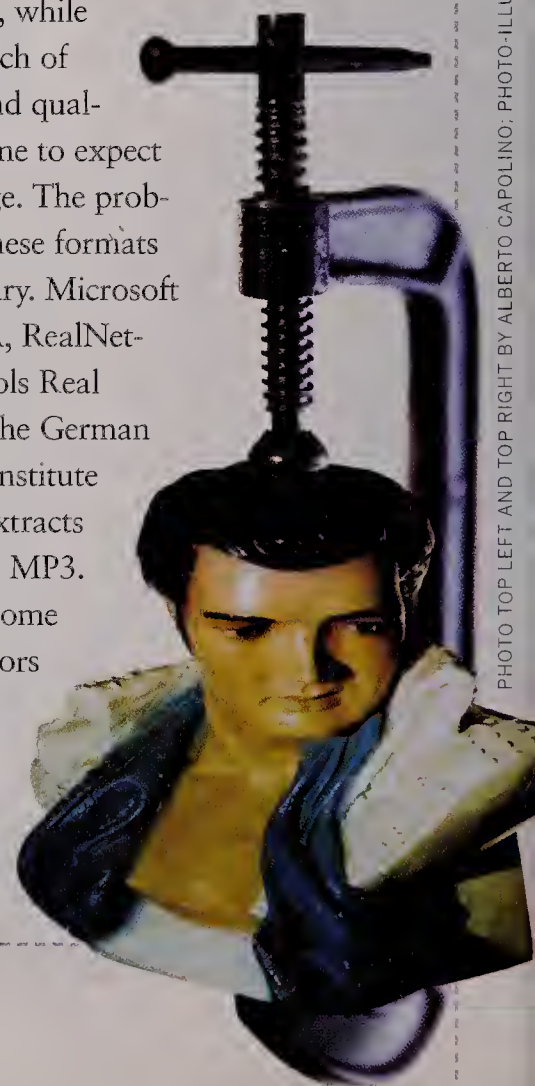
without damaging the work at all,” says Peter Wayner, author of the definitive text *Disappearing Cryptography* (Morgan Kaufman, May 2002). “In fact, the hidden message will be readable only by a program designed to extract it,” and the copyright holders will be able to prevent use of the file if the program determines the file was illegally downloaded, he says.

Naturally, the technology will need to be further developed and, Wayner says, politics will have to be hashed out before such steganography is legally accepted. Even so, steganography is sure to make its little secret mark in 2003. —Scott Berinato

DIGITAL AUDIO

26. “You Ain't Nothin' but Ogg Vorbis”

TODAY, THE MOST easily downloadable digital music sits in one of three formats: MP3, Real Audio and Windows Media Audio (.WMA). All three use compression algorithms to shrink huge files into manageable sizes, while retaining much of the clarity and quality we've come to expect in the CD age. The problem is that these formats are proprietary. Microsoft owns .WMA, RealNetworks controls Real Audio, and the German Fraunhofer Institute owns (and extracts royalties for) MP3. As a result, some smaller vendors and music makers can't afford to play in the digital audio



game, while some listeners are bugged by the thought that their favorite tunes are held hostage by corporate-owned formats.

Enter Ogg Vorbis—open-source software created by the Xiph.org Foundation that will let anyone create applications to make or play back multimedia files, at a quality as good as or better than the best commercial code and without the overhead of royalties, restrictive licenses or other fees. Ogg Vorbis (Ogg named after a character in a video game and Vorbis after a character in a science fantasy novel) is the digital music portion of Xiph's in-development multimedia suite of tools for creating and distributing digital audio and video free from the controls of large corporations. The video code is scheduled to roll out next June (all can be downloaded from www.xiph.org).

Free audio and video software is a compelling proposition, but Ogg's creators—two full-timers living off unemployment checks and donations, along with four or five volunteers—say they don't have the time, or the inclination, to create a movement à la Linux. For Ogg Vorbis to take off in 2003, end users who want to make digital music as cheaply as possible without sacrificing sound quality must spread the word.

In the meantime, Ogg faces the problems of any new product entering an established marketplace. "You have other compression technologies from MP3 to .WMA, to whatever else might be out there," says Mike Paxton, senior analyst at Scottsdale, Ariz.-based In-Stat/MDR. "These are accepted as industry standards and are supported by the [vendors]" that already produce software and hardware that support the existing formats.

None of that bothers Emmett Plant, the Philadelphia-based CEO of Xiph.org Foundation, who helped start the project after being laid off from Web-hosting company Digital Island during one of its multiple purges. "We present an alternative," he says. "The fact that our alternative kicks theirs is just a bonus." —Christopher Lindquist

MARKETING

27. The Homeland Brand

NEVER UNDERESTIMATE THE marketing profession's willingness to try and shake loose-change from the pockets of the sacred. The latest evidence: Homeland Security, the brand, which we will only see more of in 2003.

The brand has already turned up on doormats and casino tokens, and on Woolrich's Homeland Blanket (above), a star-spangled throw that Herringtoncatalog.com touts as a "patriotic tribute to freedom." The blended wool (84 percent) and nylon blanket promises to "keep you and your spouse cozy and warm when threats to our security put a chill in the air." Just \$129.

In the IT world, technology vendors are wrapping themselves in their own homeland security blanket to ward off the chill of the down economy. Siebel is pitching "terrorist relationship management" software called Siebel Homeland Security. In a company white paper, Siebel suggests that its software could have helped mitigate the 9/11 and anthrax attacks. Under a section labeled Prevention, the 9/11 case study concludes that "using the automated workflow capabilities of the Siebel solution, an agent could have swiftly alerted other agencies and law enforcement authorities to take appropriate actions."

PeopleSoft has announced two homeland security products—one that tracks foreign students and one that manages emergency response. Both Dell and Hewlett-Packard have set up Homeland Security websites, with Dell's featuring an American flag in the top-left corner. At Computer Science Corp., the company has made its vice president of homeland security available to the press to answer the question, Where is the homeland security boom so many have promised?

Technology pundits have called this boom a \$9.5 billion market, and many tech companies have launched homeland security initiatives—not to partner with the government but to sell to it.

"It's not surprising at all that [vendors are] trading on people's fears," says Alex Molnar, a marketing expert and professor of education policy at Arizona State University. "That's the whole idea of marketing—to make you afraid. In this case, [the fear is] that you're not patriotic if you don't buy something."

At the very least, a red-white-and-blue throw. —Scott Berinato

TELEPHONY

28. VoIP Speaks Softly

IF AN AUTOMOBILE manufacturer sent you a notice touting a new diesel engine that performed just as well as the conventional one in your current car—no better, no worse—would you ask your mechanic

VoIP Whispers, It Does Not Shout

When over 600 IT executives were asked in 2002 about VoIP implementations:

14% had completed or were in the process of completing a VoIP rollout.

43% were considering or piloting VoIP projects.

43% had no answer or no plans for VoIP.

SOURCE: FORRESTER RESEARCH

to rip out the one under your hood in order to replace it? That's the dilemma facing voice over IP (VoIP). The advantages of an IP-voice network over traditional telephony are not staggering—the per-call price is pretty much the same, and most people won't be persuaded by VoIP features like the ability to route voice mails to an e-mail inbox—and, in this economy, the cost of replacing the copper phone lines with Ethernet cable just isn't worth it.

To be sure, VoIP is growing. Cisco sold its 1 millionth IP phone in August, and analysts expect the VoIP market to double in 2003. However, many millions of traditional phones are sold every year (as a point of reference, more than 94 million cell phones were sold in the third quarter of 2001). "It will be a slow adoption," says Christine Hartman, research director at Cedar Knolls, N.J.-based Probe Research. She says companies will transition to VoIP over time when they start a replacement cycle.

That said, Hartman strongly encourages CIOs to install VoIP networks whenever they have to replace their existing telecom infrastructure or expand it to a new office—a move that only requires equipping each workstation with two Ethernet connections instead of one. David Fraley, a principal analyst with Stamford, Conn.-based Gartner, adds that using a VoIP network in your contact center (formerly known as the call center) can consolidate all customer contacts—phone calls, e-mails, faxes—on a single network, thereby making it a snap to maintain an up-to-date customer profile. That, he suggests, is a worthwhile investment.

The biggest hurdle to VoIP adoption may come from the beleaguered telecom industry, which Fraley says is in the "midst of a great depression." Traditionally, telecoms spend 10 percent to 12 percent of their revenue on infrastructure maintenance. Now, they're spending 8 percent. The cuts, says Fraley, could push truly widespread VoIP adoption back from 2010 to 2015.

—Ben Worthen

CUSTOMER RELATIONS

29. Blogging for Bucks

GONE ARE THE DAYS of secretive scribbles in a leather-bound diary. Today's preferred medium for personal expressions is the Web log—a small, regularly updated online journal that combines a person's commentary with links to other content she recommends. For example, people who visit Salon.com no longer have to verbalize their vitriolic disagreement. They can chronicle their thoughts about an article—or anything else for that matter—in their own Web log, or "blog," on the site. Blogs are not just a forum for people who like to read their own words, though. Just ask the head of your marketing department.

Though blogs first gained popularity on news sites like Salon.com, Slate and MSNBC.com, companies are beginning to realize that same brand of opinion and news content can be a crackerjack sales, marketing and communications tool. Consequently, more of them are hopping on the blogging bandwagon.

Macromedia, the San Francisco-based developer of Flash and Shockwave software, has been using blogs to share information with its customers since last May. At that time, the company had just released three new software products directly to the Internet, and it wanted to get feedback as quickly as possible in case there were bugs or other problems. The company decided to put a set of blogs on its site, each administered by a single community manager who

could communicate directly with customers, answer their questions and direct them to other Web content that might interest them. "Within the space of a couple days we had hundreds of thousands of posts," says Tom Hale, Macromedia's vice president in charge of developer relations. Not only do the blogs help Macromedia quickly troubleshoot its products and respond to customers' concerns, they have spawned little communities where serious users can share advice.

Unlike questions sent via an online feedback form, the blogs enable the company to amass feedback, post information and patches to the site, and reach their user community very quickly. The blogs have also become a valuable marketing tool. The exchanges that occur between the community managers and visitors provide useful content in a personal rather than PR-ish tone and present Macromedia as a trusted information provider to its user community. While it might not feel like a marketing tool, the opt-in nature of the technology makes it an appealing way to establish and maintain low-pressure, high-value relationships with customers.

—Daintry Duffy



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THE SOFTWARE MARKET

30. Vendor Smackdown

"NOBODY IS BUYING software right now," says Ken Harris, senior vice president and CIO of San Francisco-based retailer the Gap. "The market has stopped dead in its tracks."

Harris overstates the case a little; the CIO magazine Tech Poll predicts overall IT spending will grow by at least 4.4 percent even if the economic downturn continues through the first half of 2003. But CIOs have been squeezing vendors for more than a year now, and in 2003 any vendor wanting to win new business or renew contracts will need to respond to very tough questions about ROI and demands for concessions that would have been unheard of a few years ago. "Buyers are saying, Give me the software for free and charge me annual maintenance," Harris says. Free!? Vendors won't do that, say analysts, but it's the kind of proposition that comes up when both parties' backs are pinned to the wall.

Another trend is rethinking maintenance contracts for hardware and, especially,

software. After getting hit with maintenance bills of 18 percent to 25 percent of the software license fees annually, CIOs are pushing to lower their costs over the long haul with tighter maintenance contracts. Some CIOs are breaking with per-seat licensing and maintenance contracts because they're losing the people that used to sit in those seats to layoffs and sell-offs. They're inserting downturn clauses that account for downsizing and dramatic economic shortfalls. Some are insisting fees be based on headcount and be renegotiated annually. Others are eschewing maintenance contracts altogether, going to a per-incident policy. It's riskier because the cost to fix individual problems is much higher, but CIOs are finding that after they've had big systems like ERP or CRM in for a few years, the systems are pretty stable, and they don't need someone hanging on at the other end of the 800-line.

A friendlier negotiation approach that CIOs have used and will continue to leverage in 2003 is the hat-in-hand tack—as in, "Look, I'm suffering here, what can you do for me?"—in return for a pledge to try to swing more business to the vendor when better times return. Vendor consolidation is another tactic that can help CIOs without hurting the remaining vendors.

When a customer consolidates its IT spending with fewer suppliers, those suppliers can lower their prices and offset the blow to their margins by the boost in volume.

But regardless of whether the negotiations are friendly or heated, we are in a buyer's market unlike any since the early '90s. And CIOs in 2003 will need a strategy to capitalize on it without permanently alienating the vendors that they need over the long haul. It won't be an easy year for either side.

—Christopher Koch

W. BRIAN ARTHUR ON BUSINESS CYCLES

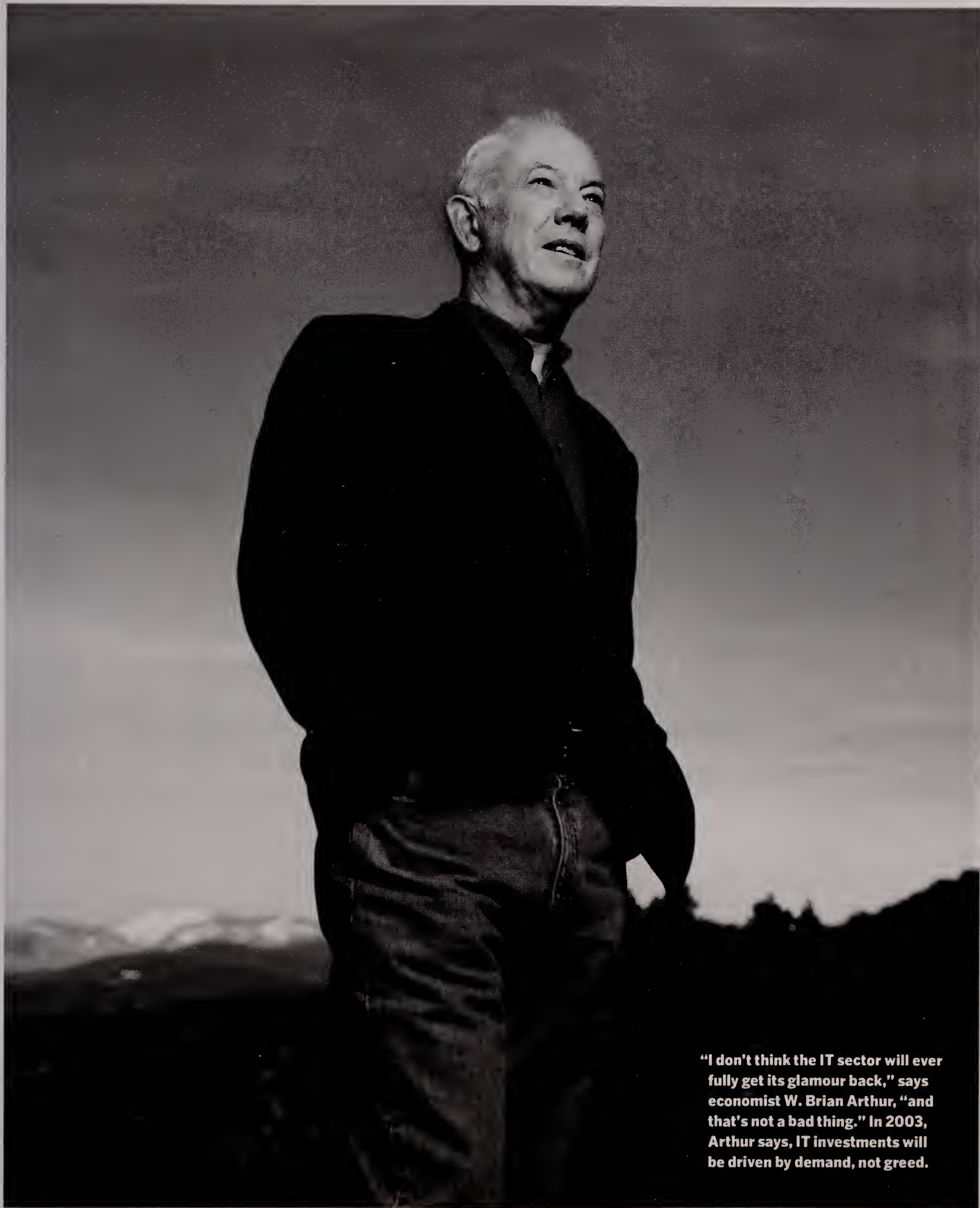
31. Never Mind the Crash, Here Comes the Buildout

AS WE ENTER YEAR THREE of the IT dol-drums, one can be forgiven for bowing to the pessimistic view that IT has had its day in the sun and we have awoken in the gray dawn of a permanently depressed industry. Wrong! It's just one hell of a hangover, says economist W. Brian Arthur. "We had a huge party in the late 1990s," he says. "Now it's time to get up out of bed and begin a solid, serious technology buildout."

A buildout? While most companies are still battenning down? Yes, says Arthur, 57, the Belfast, Ireland-born Citibank professor at the Santa Fe Institute in Santa Fe, N.M. A professed technophobe, Arthur has made a study of past technology revolutions—transportation, power, raw materials and manufacturing processes—and says this history, dating back to the 18th century, reveals parallels to our IT revolution, complete with crashes caused by speculation, overexpansion and the irrational exuberance of investors. In each case, he says, the crash was followed by a massive buildout, leading to a golden age. (See www.cio.com/printlinks for a full explanation of these historical patterns.)

Arthur believes 2003 will be the staging year for the IT revolution's buildout. "Devices continue to be bought and used," he argues. "We continue to see productivity gains." One analogy is to the railroad industry. Rail stocks became anathema in the depression of 1859, when the nation had about 30,000 miles of track. "But the trains kept running, and the [industry] started to construct again," he says. By





"I don't think the IT sector will ever fully get its glamour back," says economist W. Brian Arthur, "and that's not a bad thing." In 2003, Arthur says, IT investments will be driven by demand, not greed.

1914, there were 253,000 miles of track.

For the IT sector, the big post-crash change is that demand has replaced greed as the driver for growth. "In 2003, the sector will be driven much more by demand for what's needed in industry," says Arthur. "Investment will follow rather than lead." That shift, he says, means we have developed the sobriety necessary for a sustainable buildout. "I don't think the IT sector will ever fully get its glamour back, and that's not a bad thing," he adds.

With the IT equivalent of 223,000 miles of track to be laid, we're going to need a lot of track bed—that is, infrastructure. Just as the Eisenhower Interstate Highway System made it easy for people to drive long distances, ushering in the automobile industry's golden age, broadband will pave the road to IT's buildout, according to Arthur. Universally available wireless and fiber connections will provide the capacity to transmit messages almost instantaneously across effectively infinite channels.

But, you say, broadband faces numerous obstacles. Even its proponents don't want to pay for that last-mile connection to our homes. "This is history repeating," says Arthur. "By the 1940s, we knew how to build highways, but there was no single firm or group of consumers who could make it happen. Roosevelt tried to launch a highway system in 1938, but the states didn't want to pay." There are also political barriers to broadband: Content providers worry they'll suffer losses to piracy. "Broadband will not fully arrive until these parties get together and come to an agreement. And that's not going to happen outside of Washington," Arthur says. "Heads need to be knocked."

Arthur's analysis underscores how short our economic memories are. "We continue to be surprised that so much of what happened hundreds of years ago repeats now when we think we're so modern and different," he says. "I do wish I had looked into this earlier. If I had, I might have seen this crash coming." —Richard Pastore

AIRLINE SECURITY

32. Who Do You Trust?

WHEN THE NEW HEAD of the Transportation Security Administration (TSA), Adm. James Loy, testified before the Senate Commerce Committee this past fall, Sen. John Breaux (D-La.) greeted him with a wisecrack that suggests why the "trusted traveler" program—which would allow prescreened passengers to speed through security—will become a reality in 2003. "Admiral," said Breaux, "I don't think that I possess a single piece of clothing that has not been seen by an airport screener."

A lot of members of Congress—all frequent fliers—have made similar observations, which means the concept of a trusted traveler program is top-of-mind for them.

The only problem is that the program may not be all that trustworthy.

Proposed by the trade group Air Transport Association (ATA) on behalf of several major airlines, the program would be a post-9/11 version of first class. Frequent fliers would agree to background checks and, if they pass muster, pay for a smart card that would allow them to slide through security checkpoints.

Opponents say that's elitist and would

violate the civil liberties of those less likely to qualify—say, persons of Middle Eastern descent—while introducing new security problems, such as the possibility that a terrorist could get trusted status. Advocates, including major carriers desperate to decrease the hassle factor of flying, say the program would shorten lines for everybody and free up security personnel to concentrate on travelers who pose real threats.

"Everyone is not an equal security risk," says Michael Wascom, an ATA spokesman, "and the overwhelming majority are no risk at all. Frankly, the time has come for political correctness to be put aside for what's in the best national security interest for our nation."

TSA, part of the Department of Transportation, has not yet worked out the details of who could qualify for the program, how the smart ID cards would work, what the program would cost and what security qualifying travelers would pass through before boarding. Loy favors the program (which is temporarily on hold) but not the name. "[It] suggests we don't trust all the other players," he told the Commerce Committee. Instead, Loy prefers the phrase "registered traveler."

"You can call it whatever you want, it's still the same thing," says Billie H. Vincent, a former head of security for the Federal Aviation Administration turned consultant.



Passengers line up at Boston's Logan Airport shortly after 9/11. A new program could shorten lines—but at what cost?

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"Our society is much too diverse to be able to classify people one way or the other. A number of those 19 hijackers on 9/11 could very well have qualified as a trusted traveler."

Vincent, like Breaux, has plenty of clothing that's been seen by security screeners—he just has a different idea of what's a hassle and what's a necessary security procedure. Talking on a cell phone as he waits to catch a flight, he says he logs more than 160,000 miles a year, which wins him all sorts of perks. "Give me those perks in upgrades or on the airplane, but don't give them to me at a screening point, because all you're doing is decreasing my safety," he says.

—Sarah D. Scalet

THE CUTTING EDGE

33. Application Apparel

CHANCES ARE, you've already seen someone with wearable computing gear and just not realized that beneath that geeky-looking guy's coat was the same technology you have on your desktop.

Wearable computing isn't just the stuff of science fiction. It's already here and in use today—from an aircraft technician's full-color head-mounted display that shows him exactly which engine part needs to be replaced to a teenager's ultrahip jacket that hides a PC, wireless Internet connection and MP3 player. "It's not future technology," says Mike Binko, a spokesman for Fairfax, Va.-based Xybernaut, one of the front-runners in the wearable computing arena and maker of wearable computers used by FedEx and Bell Canada. "People think that it doesn't work with the Internet or wireless or extranet or dial-up. No matter what connectivity you have, it'll work."

For years, the early adopters of wearable computing have been the military, aero-



space and the government. More recently, it's also finding its way into the transportation, telecommunications and utilities industries. Providing hands-free computing to soldiers, utility workers and deliverymen as well as giving them the ability to access and update information on their organization's network in real-time have been the major forces behind wider adoption of wearable computers. In 2003 and beyond, as companies look to streamline technical work and integrate all realms of disparate company data, wearable computing will emerge as an attractive option.

On the consumer side, you won't be seeing a \$5,000, high-end wearable PC at your local Wal-Mart anytime soon, although wearable computing will continue to inch toward the mainstream stitch by stitch. Many university research groups, including MIT's Media Lab, are exploring the next generation of wearables. MIT's recent MITHril project is an all-in-one hardware platform (woven into a vest with an accompanying head-mounted display) built with off-the-shelf components and custom-engineered parts.

The wearable trend is growing. Venture Development predicts that worldwide shipments of wearable computers will reach \$158 million in

I, Robot: You'll be the envy of every android strolling down the avenue in MIT Media Lab's wearable computing vest.

2003, and more than a half a billion dollars by 2006. The fastest-growing usage categories for wearable technology, according to the Natick, Mass.-based market researcher, will be bio-monitoring, Internet access and PDA-centric functionality. So it appears that wearables are here to stay. Now we just have to try not to look like a geek while wearing them.

—Tom Wailgum

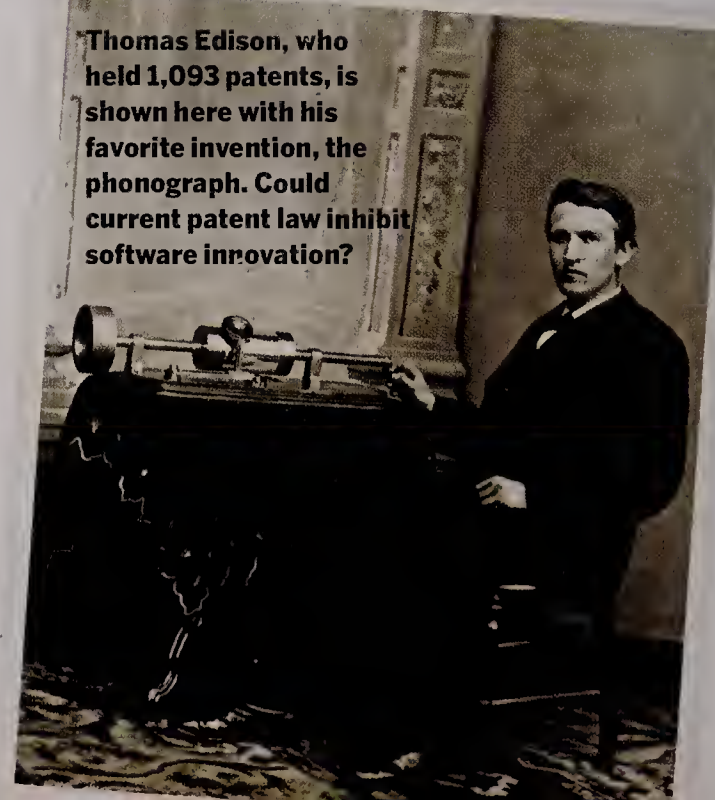
INNOVATION

34. Patently Stupid?

IN THE LATE 1990s, when the federal courts began to show interest in protecting software with patents, it caused a stampede at the U.S. Patent Office. "Microsoft five to six years ago had very few patents, and now it has roughly 2,000," says Suzanne Harrison, senior vice president of ICMG, an intellectual property management company in Palo Alto, Calif. IBM has 20,000 patents and gets \$1.7 billion per year for licensing those patents to other vendors, Harrison says.

With intellectual property, one of the biggest untapped sources of value in companies today, she says, the software industry

Thomas Edison, who held 1,093 patents, is shown here with his favorite invention, the phonograph. Could current patent law inhibit software innovation?



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has begun to look more like the pharmaceutical industry, where companies zealously protect drug patents. "CEOs would be remiss if they didn't go after that value," Harrison says.

But it's not clear whether what works for pharmaceutical companies will work for software. There is a threat for 2003 and beyond that patents could hurt software innovation as much as or more than they help it. Critics' complaints that software is poorly understood by the Patent Office aren't helped by the fact that vendors don't release their source codes for scrutiny. (Pharmaceutical companies, in contrast, release development documentation by the truckload.) That's meant that the overwhelmed Patent Office has approved several dubious patents because it could not find evidence that someone else had already come up with the idea (during its so-called prior art research). Worse, software changes so rapidly that patents have to be broad, covering the concepts behind the software so that they can remain relevant for years. That may make the patents too vague for other inventors to know whether they can work around them. It also means the patents are less likely to hold up in court. For example, British Telecom (BT) patented hyperlinking before the Web came along, and then tried to enforce the patent against companies that used hyperlinking on the Web. A federal court ruled that BT was trying to cover too much ground, and in late September, BT was forced to abandon its efforts to uphold the patent.

A big company like BT can afford a long, bitter legal battle to test the merits of its patent. Smaller vendors and independent developers don't have that luxury. Indeed, the darkest view of the patent frenzy is that poorly written, overly broad patents owned by big companies with deep pockets will be used as blunt weapons to discourage those small companies from trying to invent new software. The little guy simply won't want to risk getting dragged into court, no matter how ques-

tionable the patents may seem. "Taking out a patent doesn't cost that much, but challenging it in court does," says Mark Webbink, senior vice president and general counsel for Red Hat, the Raleigh, N.C.-based distributor of the open-source GNU/Linux operating system.

Of course, patent proponents have an equally forceful argument: If you don't allow inventors to protect their ideas from copycats, they will be less likely to invent in the first place.

These arguments have come up before. When a new technology comes along, there's always a lot of noise and litigation, says Mark F. Radcliffe, a partner at Gray, Cary, Ware & Freidenrich, a law firm in Palo Alto. "In the long run, patents have always proven to be good for innovation," he says.

But as inventors increasingly move behind the walls of corporations—which have goals to build and protect revenue as well as to innovate—it's not clear at the start of 2003 whether the software patent frenzy will cause innovation to flower or be trampled.

—Christopher Koch

SMART SOFTWARE

35. The New, New Intelligence

A YEAR AGO, the Army began using intelligent software agents instead of people to route the background files of soldiers who required security clearance to the proper authorities for review.

The result: A process that once took days now takes 24 hours. The Army reduced its year-long backlog, and the Army Central Clearance Facility in Fort Meade, Md., can now handle 30 percent more requests a year. The intelligent agent retrieves the necessary background information from existing records and builds



Steve Cooper, CIO of the Office for Homeland Security, says intelligent agents will be part of the government's security strategy.

an electronic folder for each case. It then examines the file to determine if there are warning signs—financial problems, arrests, anything to indicate a person might be susceptible to improper influence—or if it's a clean case. Human investigators take closer looks at the tough cases.

Intelligent agents are semiautonomous, proactive and adaptive software systems that can act on a user's behalf. Give an intelligent agent a goal—help a U.S. ambassador pick a safe evacuation route following a terrorist attack in a foreign country—and it creates the best plan after gathering weather information, news reports, airplane schedules, road information and police reports.

The military, intelligence and law enforcement communities see software agents as a tool for dealing with the daunting task of having to retrieve and monitor huge amounts of data in ongoing investigations or to prevent potential problems (from terrorist activity to insider trading).

Such agents can also help investigators identify unusual patterns of activity, says Henry Lieberman, research scientist and leader of the Software Agents Group at the MIT Media Lab in Cambridge, Mass. "Law enforcement can say to an intelligent agent, Let me know when any person

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Reshape

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arrived from a sensitive Middle Eastern country that was recently involved in a large bank transfer. Or government agencies like the Securities and Exchange Commission can use them to monitor financial statements for fraud. Maybe they could have caught the whole Enron thing earlier," says Lieberman.

Government agencies say they want to use the agents, but most are still defining how exactly. Steve Cooper, CIO of the Office for Homeland Security, says intelligent agents will be part of the government's data-sharing strategy. NASA is exploring using fix agents to help boost mission-launch rates. Oak Ridge National Laboratory researchers are studying agents for use in military command and control centers.

But the issue of trust may deter their widespread adoption in business.

"People just aren't used to using these kinds of things yet," says Lieberman.

"When you first start using one of these agents, you have to watch it closely to make sure it's doing what you want. But performance improves over time. And the agent just makes a proposal. Then it's up to you."

—Stephanie Overby

WEB SERVICES

36. The Little Tech Engine That Might

IN 2002, WEB SERVICES went from being little known and misunderstood to being well known and misunderstood, leaving CIOs with more questions than answers. How would Web services connections be secured? Whose standards would really become standards? It looks like the answers will come in 2003 as Web services ramps up for full-fledged adoption in 2004.

In case you tuned out the hype, Web services comprises Internet (or other IP-network-based) applications built with

XML and other emerging standards that allow machines to communicate without human facilitation. For example, rather than customizing a credit card verification function for every e-commerce application, a CIO could subscribe to a preexisting Web service that his e-commerce app could query whenever it needed to run a credit check. Since Web services is platform neutral, it makes it possible to write a piece of code or even a whole application once and use it over and over again, thereby making integration between systems simple. That's a lot of potential for one technology.

But enterprisewise, Web services is still not ready for prime time. While CIOs have launched internal Web services projects, few have ventured outside the corporate firewall. There are three reasons why. For starters, there are no security protocols right now. Second, nobody knows how to use Universal Description, Discovery and Integration, or UDDI, the Web services directory protocol that's supposed to work like an online Yellow Pages. And most of all, CIOs are skeptical that longtime rivals such as Sun and Microsoft will be able to agree on Web services standards.

The smart money says we'll find out in 2003 whether that skepticism is justified. Vendors and industry consortia currently are championing various standards and protocols, but Gartner Research Director Ray Valdes says that in 2003 the vendors will drop their gloves and cooperate. Working together, argues Valdes, will ensure that the best solutions survive. Of course, IT executives have heard that one before. Remember Java? Many fear that industrywide standards won't, in fact, emerge anytime soon—or worse, that competing standards will. Valdes replies

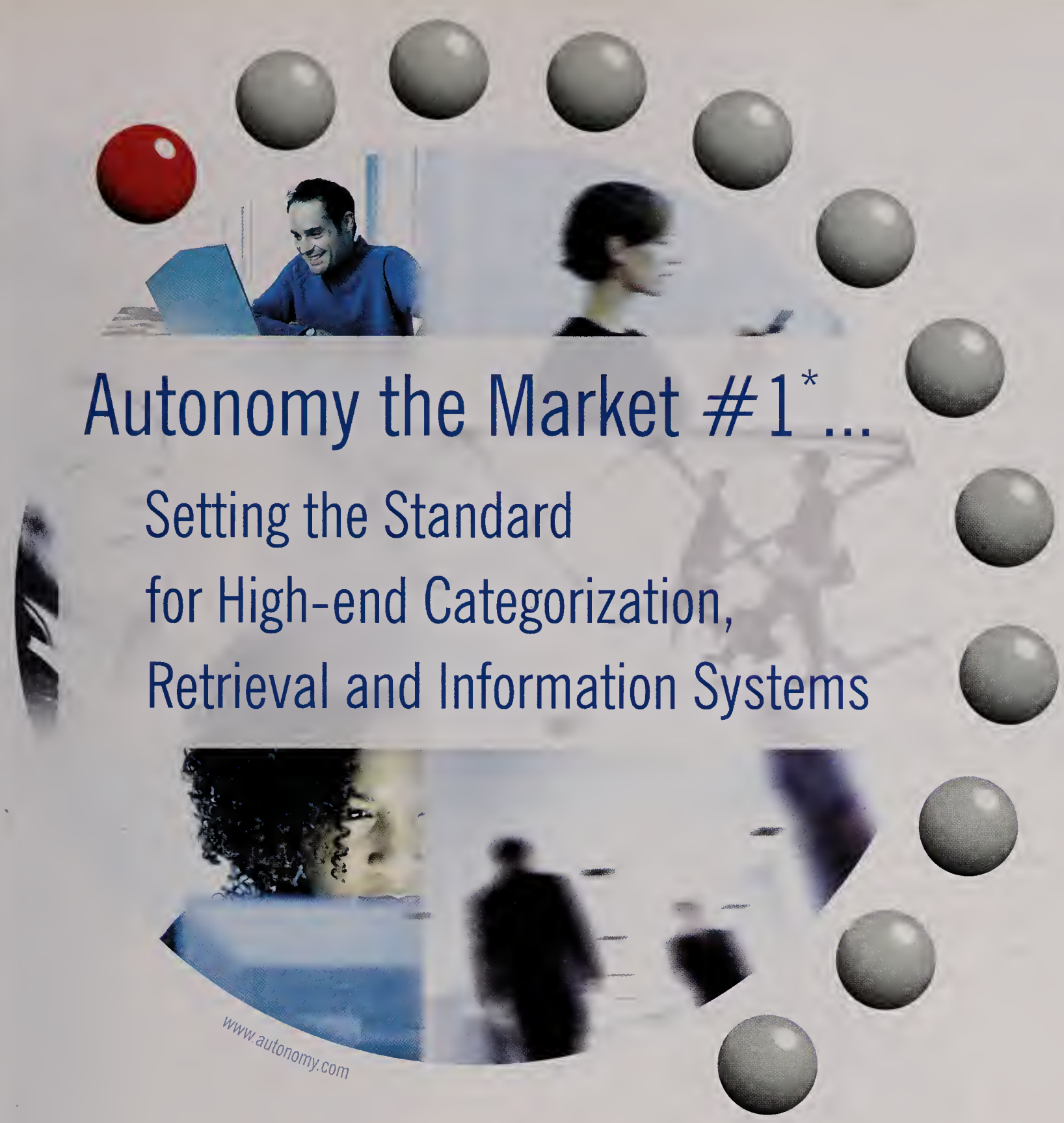
that such worries are premature. "When people ask me who's ahead, I say it doesn't matter," says Valdes. "We're only 10 percent to 15 percent of the way there."

While CIOs may wish to pursue a cautious approach by running internal pilots until all the standards are set in place, John Hagel, author of *Net Gain* and the recently published *Out of the Box* about Web services, says they may not be afforded that luxury for long. "The early adopters driving Web services are business-line managers who have a major business problem," he says. "They've been told to reduce cost or inventory, and they've been looking for ways to do this." Hagel says that he has spoken with at least 60 line-of-business managers who are doing some form of Web services project without the IT department's blessing. For the Hagel 60, Web services, warts and all, is too tempting to resist.

The biggest challenge for CIOs in 2003, Hagel implies, will be to hold off eager business-line managers until the necessary Web services standards emerge midyear.

—Ben Worthen





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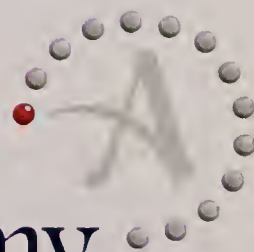
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EUGENE CHAN ON DNA

37. Big Gene Machine

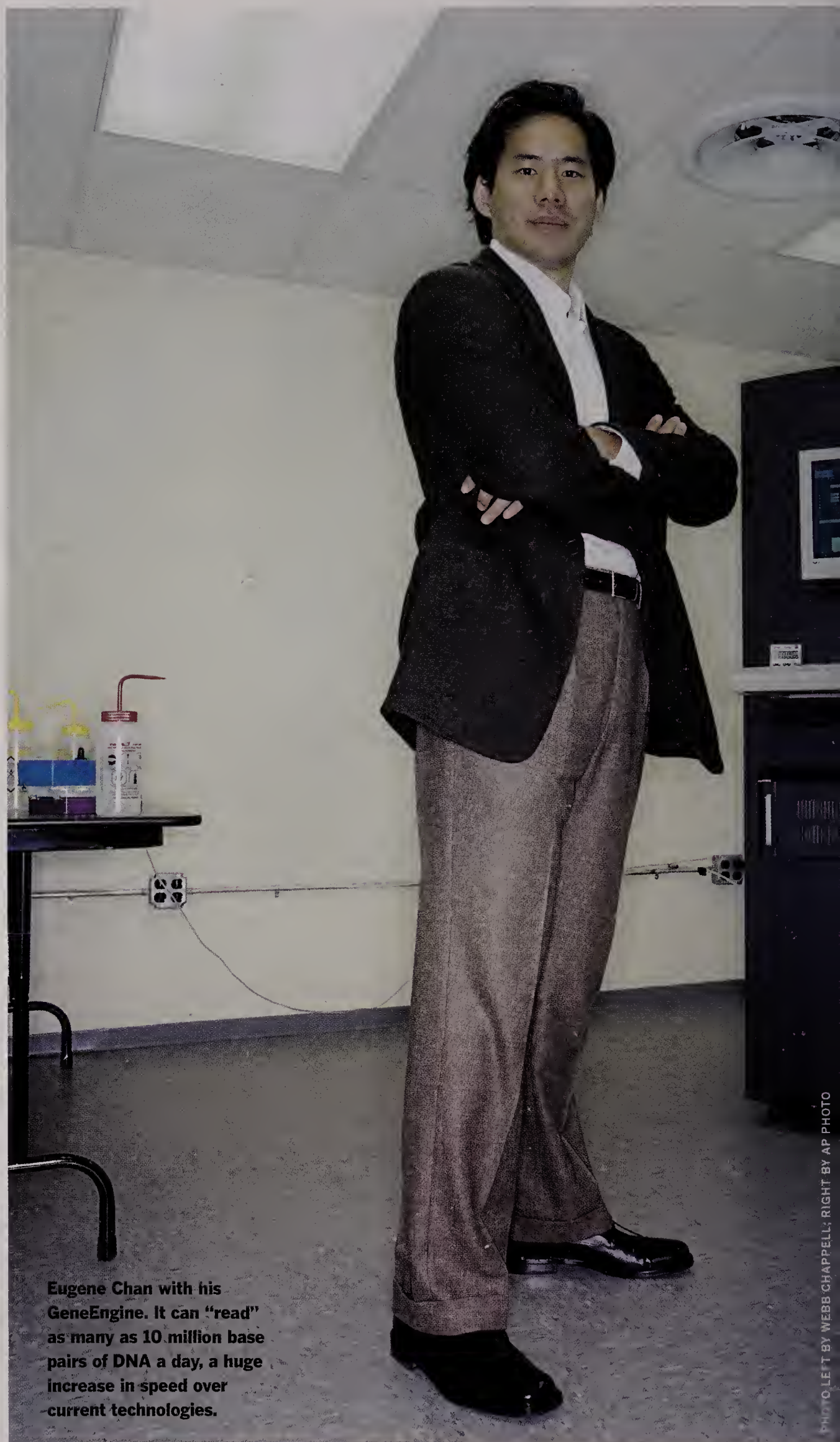
FIVE YEARS AGO, when Eugene Chan, then 24, announced that he was dropping out of Harvard Medical School to pursue the lodestar of faster, more powerful DNA analysis, friends and family asked, “Eugene, are you crazy?”

Chan was giving up a promising medical career for the capricious future of a biotech startup. And who knew if the idea he carried around in his head—that a machine could mimic nature’s own method of instantaneous DNA replication—would ever translate into a workable technology.

Chan knew. In early 2003, Chan’s now 45-employee company, US Genomics, will begin selling the GeneEngine, a device that can analyze 200,000 base pairs of DNA in seconds and thus “read” as many as 10 million base pairs of DNA a day. That’s a quantum leap over existing sequencing technologies that permit researchers to scan a mere 500,000 base pairs per day by breaking the DNA down into small chunks. The GeneEngine, essentially a nanochip hooked up to a supercomputer, scans strands of DNA in a linear fashion, like a ticker tape, with no limit on the size of DNA that can be read in each run.

The ramifications of more rapid DNA analysis are enormous. According to Robert Langer, a professor of chemical and biomedical engineering at MIT who was among the first to hear Chan’s idea, it will bring scientists that much closer to the Holy Grail: a detailed understanding of diseases such as diabetes and cancer caused by the interaction of a number of genes. And that, in turn, should lead to the tailoring of more effective medicines for patients based on their individual genomic information.

It was that potential that beguiled the young Chan as he pondered his future. “If I had stayed in medical school, this never would have happened,” says Chan,



Eugene Chan with his GeneEngine. It can “read” as many as 10 million base pairs of DNA a day, a huge increase in speed over current technologies.

PHOTO LEFT BY WEBB CHAPPELL; RIGHT BY AP PHOTO



sprawled in jeans and a blue polo shirt on a chair in his company's nondescript office, squirreled away in the back of a Woburn, Mass., office park.

Chan has never been the type to sit and wait for destiny. As a high school sophomore growing up in a small town 15 miles from Morristown, N.J., he began reading books on physics even before he took the required course in school. He fell in love with the challenge of solving problems and soon started winning statewide physics contests against students who had taken college-level courses. That taught him that one didn't always have to follow a well-marked road to achieve success. It was possible to improvise.

"I was one of those people who never turned up in class, but I always aced the test," says Chan with a matter-of-fact certitude that somehow avoids boastfulness.

Chan's impatience with the established order of things would haunt him when he dropped out of medical school and began looking for the financing to pursue his idea. "Obtaining venture capital was a huge barrier because I was competing against people with advanced degrees," Chan admits. But with the help of connections he had made at MIT (while in the joint Health Science Harvard and MIT program), Chan got enough funding to at least try to prove that his concept could work. His success, he recalls, had a lot to do with his knowledge of physics and his ability to use mathematical algorithms to illustrate the feasibility of mimicking nature's trick.

And sure enough, six months later, Chan showed the scientific world that tightly coiled strands of DNA could indeed be unrolled and read in a linear fashion. It took the next four years to build a device that worked. Chan and his colleagues at US Genomics painstakingly constructed a nanochip containing micro-

scopic "obstacles" (much like the pins in a pinball machine) that are 10,000 times smaller than the width of a human hair and can unfurl DNA. The linear DNA is then read by microscopic lasers.

Biotech hotshots like Craig Venter (president of the first company to map an entire human genome) sit on the board of US Genomics, and the company has so far been funded to the tune of \$25 million. All because an impatient 24-year-old with a knack for problem-solving trusted what he knew he knew.

—Alison Bass

MEDICINE

38. All Inside the Family

THE MEMBERS OF the Jacobs family don't consider themselves unusual. In fact, up until earlier this year, they considered themselves average, as did their neighbors in Florida. That changed last May when, at the urging of their 14-year-old son Derek, they became the first family to all have the grain-size

VeriChip implanted in their right arm. Derek's idea was that the VeriChip, which was developed by Palm Beach, Fla.-based Applied Digital Solutions and keeps track of a user's important personal information, might someday save the life of his father, Jeffrey, who survived cancer, a car crash and spinal injuries. Jeffrey's chip tracks his medical history, just in case something else happens; Derek and his mother, Leslie, chipped themselves simply

because they wanted to.

Implant technology is not a new idea. Pet lovers have been using chips to find Fido and Fluffy since the mid-1990s, and scientists use them to track the movement and life span of endangered wildlife. But now implant technology is moving into the



The implanted Jacobs family (from left): Derek, Jeffrey and Leslie.

human realm for a variety of security purposes (recovering kidnapped children, for example) as well as medical ones.

The chip the Jacobs were implanted with in a Boca Raton, Fla., medical office last spring is actually a radio frequency identification device that transmits a unique verification number when triggered with a handheld or walkthrough scanner. This verification number can be used to access a secure storage site hosted by Applied Digital Solutions either by telephone or Internet. In Jeffrey's case, the number unlocks his medical history. The Jacobs family can access the storage site through the Internet and update any information associated with their chip numbers.

To date, about a dozen people have been implanted with the VeriChip, including chip creator and Applied Digital Solutions President Scott Silverman. "I wanted to get chipped to demonstrate to the world my confidence in the success of this technology," says Silverman. "The use of technology to enhance the quality of someone's life has been proven. When people came out with pacemakers, [society] first thought that was crazy."

The Food and Drug Administration has said it does not consider the VeriChip to be a medical device, and therefore would not regulate it. (That could change if the device is used "to assist in the diagnosis or treatment of injury or illness," according to the FDA.) For now, without government regulation, hospitals are reluctant to own and use VeriChip's equipment. Leslie Jacobs says she is not aware of any nearby hospitals that own the scanning equipment needed to retrieve the chip verification number. However, many companies are trying to figure out if the technology can be used to introduce powerful drugs into a patient's system over long periods of time, which is less harmful to the body's organs.

Leslie, for one, is a believer. "A few years ago, I would not have thought about using something like this, but we believe this technology is the wave of the future," she says.

—Julie Hanson

ENERGY SOURCES

39. Bye-Bye Batteries

IMAGINE CHATTING on your cell phone for months at a time without recharging it. Or taking a laptop on a weeklong business trip without a battery or power cord. That's the goal of scientists around the world working to perfect tiny fuel cells using microtechnology engineering.

While broad adoption of fuel cells for cars and buildings is still at least a decade away, energy experts expect fuel cells for consumer electronics to become a reality as soon as this year. Prototypes for fuel cell-powered PDAs and handsets already exist, and more can be expected in the coming year. "The first mass consumer applications are going to be in the portable area because batteries can't quite cut it anymore," says Peter Bance, CEO of CMR Fuel Cells in Cambridge, England.

Fuel cells have long been the great hope of alternative power advocates, who envision them running everything from buildings to cars, using hydrogen instead of fossil fuels. The concept is straightforward: Fuel cells work by converting chemical energy into electrical energy and heat. Unlike batteries, fuel cells are powered by fuel—usually some form of hydrogen—and need to be refueled rather than recharged. So far, however, they have been too large and too expensive to gain mass appeal. For example, installing a fuel cell generator costs five to 10 times more than a natural gas generator, says Steve Taub, director of distributed energy global gas and power at Cambridge Energy Research Associates in Cambridge, Mass.

While researchers work to reduce the size of fuel cells, the race for consumer applications is on. A researcher at Lawrence Livermore National Laboratory in Livermore, Calif., has made a fuel cell designed to power consumer electronics using replaceable fuel cartridges filled with

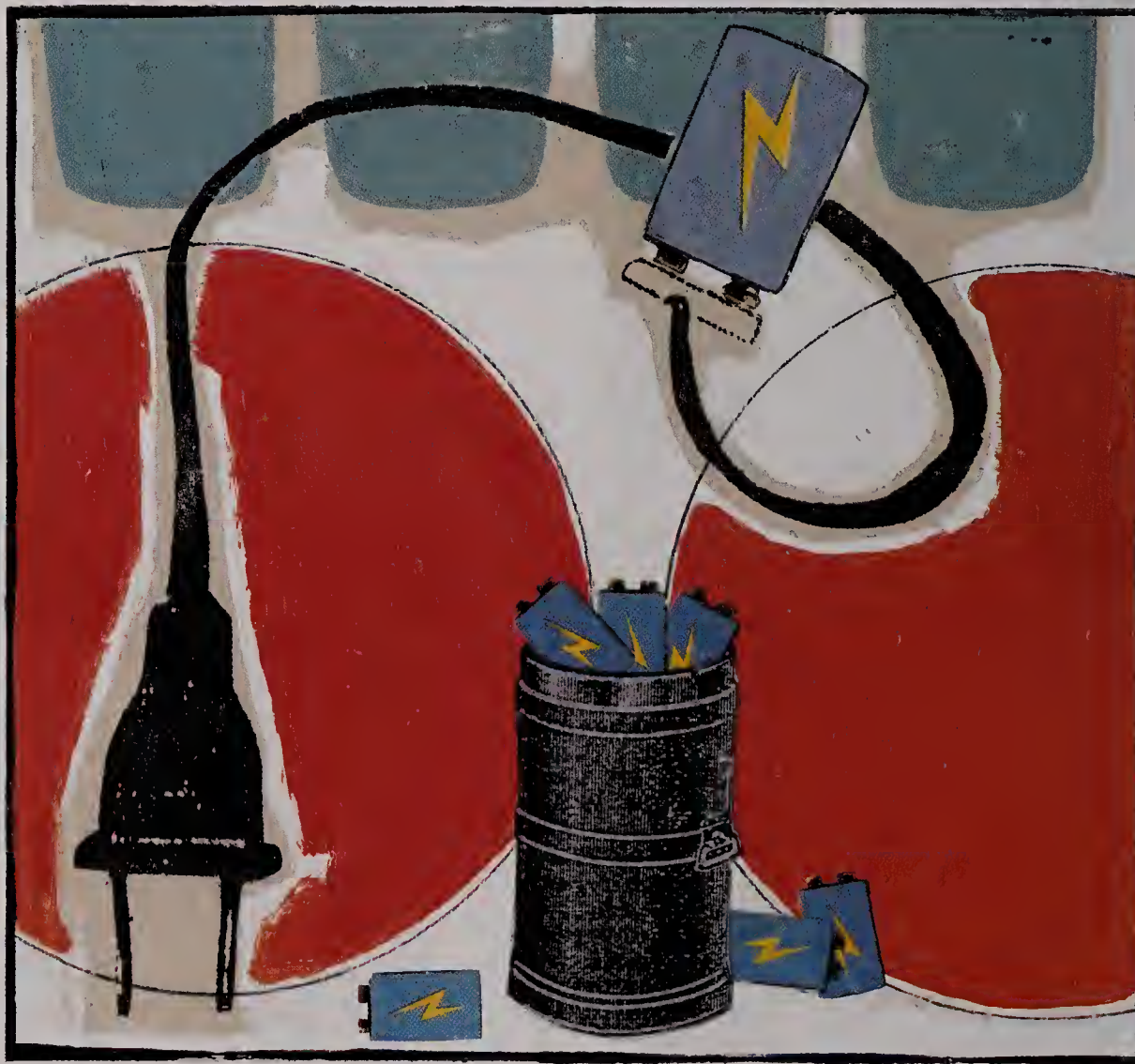


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methanol. Each fuel cell cartridge would last two to three times as long as a lithium battery lasts on a single charge. Jeff Morse, a researcher in the lab's center for micro-technology, adds that they still need to work on some "materials issues," such as thermal insulation for the fuel cells. But once those challenges are mastered, he says, next generation cell phones and hybrid personal devices could take off.

—Susannah Patton

H-1B VISAS

40. Cap On, Cap Off

IN 1998 AND 2000, when high-tech companies asked Congress to raise the cap on H-1B visas (temporary permits that allow qualified foreigners to work in the United States), nary a legislator blinked. The economy was strong, dotcoms were going concerns, and the cap rose—to 115,000 in 1998 and to 195,000 at the end of 2000. The cap, however, is slated to shrink to its original level of 65,000 in October 2003.

As that date approaches, high-tech trade groups will argue that their need to compete requires top-notch skills only available abroad. American workers' groups will

charge that companies use the

H-1B program to hire cheap foreign labor. (While the U.S. IT unemployment rate hangs at more than 5 percent, those out-of-work American IT laborers find an Information Technology Association of America (ITAA) report that the United States lacks 500,000 qualified information

technology professionals hard to swallow.)

Arlington, Va.-based ITAA and the Oakbrook Terrace, Ill.-based Computing Technology Industry Association say they will begin lobbying in the spring to boost the number of visas. They won't yet make their position public, but most expect the introduction of a bill that will either keep the cap high or eliminate it altogether.

Grassroots efforts are under way on the other side, though with smaller war chests. Alliance@IBM, a union of IBM workers in Armonk, N.Y., is looking for evidence that Big Blue laid off local workers while retaining H-1B visa holders with the same skills, and the Seattle-based Washington Alliance of Technology Workers is working to see if it's possible to get state tax breaks for companies that abstain from H-1B hiring.

The U.S. General Accounting Office is even getting involved, looking into whether companies have shown a preference for H-1B workers. The study is due out sometime in 2003.

One thing is clear: The economy will dictate the outcome in Congress. "If unemployment continues, Congress will be more attentive," says Vin O'Neill, senior legislative representative for the Institute of Electrical and Electronics Engineers, a Washington, D.C.-based professional group whose 235,000 members lobbied Congress to study the effects of H-1Bs and offshore outsourcing.

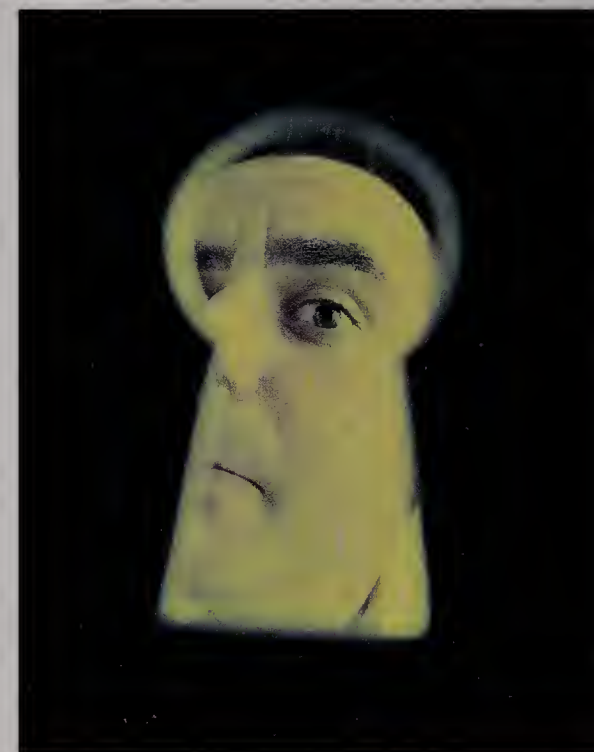
In the middle are American CIOs like Fairchild Semiconductor's senior vice president and CIO, John Watkins, who employs 40 H-1B visa holders. "I'm not sure I wouldn't feel the same way [as laid-off IT workers] if I were them," Watkins says. "But if you look at why we put this in place in the first place, it was simply because corporate America couldn't get its hands on enough qualified man power. Over the last two years, that problem has been reduced. But I don't think it's a good idea to stop the program. You never know when the economy is going to come back."

—Stephanie Overby

SECURITY AND PRIVACY

41. Big Brother IT

AFTER 9/11 and after the Enron follies, more security (and, concomitantly, less privacy) became the order of the day. Right now, to the concern of some and the delight of others, formerly niche monitoring and tracking technology applications are being repurposed for more general, widespread use. Here are three you will encounter in 2003.



1. Digital rights management (DRM).

"This will be huge," says Chris Hoofnagle, legislative counsel for the Electronic Privacy Information Center (EPIC) in Washington, D.C. Applications in the general area of DRM can turn off copy-and-paste functions, inhibit the forwarding of e-mail and prevent documents from being printed. In addition, these apps usually provide the ability to track who has done what to any document. DRM is not new, but in 2003 it will be applied far more broadly than ever.

Corporate scandals have surely driven the proliferation of DRM apps, but the everyday leaking of proprietary data over the Internet is as much to blame. "We've talked to human resources departments,



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and they say they are literally afraid to give data to their employees," says Jeffrey Melvin, CEO of Rovia in Cambridge, Mass., one of the companies packaging DRM software.

2. Defense-grade monitoring for the enterprise. "You'll see a lot of defense companies turning to the enterprise this year," says Hoofnagle. Lexington, Mass.-based defense contractor Raytheon, for example, turned a military-grade espionage application, SilentRunner, into a wholly owned spin-off in October 2001, and the new company hit the ground running with a suite of monitoring products with the same name.

SilentRunner provides high-end packet sniffing. It's similar to the FBI's famous Carnivore program but, many say, even more effective. SilentRunner "n-gram" analysis identifies and tracks similar documents without using keywords. In other words, even if you try to hide the fact that your memo is sensitive by changing all the identifying words or phrases, SilentRunner can still spot it.

3. Enhanced passenger profiling. Airlines have used computer profiling for years, but their programs were keyed only to an individual's history with the airlines. No longer. The Transportation Security Administration is working on an enhanced version of its Computer Assisted Passenger Prescreening System, called CAPPS II. This new version will check everything the old system did—if, say, you bought a one-way ticket at the last minute or if you paid cash—but it will also link to all sorts of databases to pull out and check such information as your mailing address, recent purchases, driving record, criminal history and credit rating.

Does all this go too far or is it simply a rational response to the world we now live in? Whatever your position, there's little doubt that the debate—and the technology—will heat up this year.

—Scott Berinato

DECISION SUPPORT

42. When Good People Make Bad Decisions

NEW ECONOMIC RESEARCH affirms what most executives suspect: Even when given good data, people make bad decisions. We misunderstand, misinterpret and mismanage important problems. It's not that we're stupid; our thought processes have bugs.

There are technologies emerging now to help us fix those bugs. Decision support software has been around for years, but its latest incarnations tap pervasive computing power to generate thousands of scenarios covering all conceivable real world contingencies. Products such as @risk and XL Sim allow people to test their assumptions through what is essentially repeated rolls of the dice—random number generation. The technique—known as Monte Carlo simulation—can turn ordinary spreadsheets into probabilistic wind tunnels for designing good decisions.

"With any luck, the rise of cheap, easy Monte Carlo simulations will reduce the number of stupid decisions managers make by relying on simplistic averages," says Stanford University Consulting Professor Sam Savage, the creator of XL Sim and a pioneer in spreadsheet-based statistical literacy.

Consider the case of a Silicon Valley product manager who has just been asked to forecast demand for a next-generation microchip. "The guy typically will offer a forecast range between, say, 50,000 and 150,000 units," he says.

The problem, says Savage, is that the boss doesn't want a range. He wants a

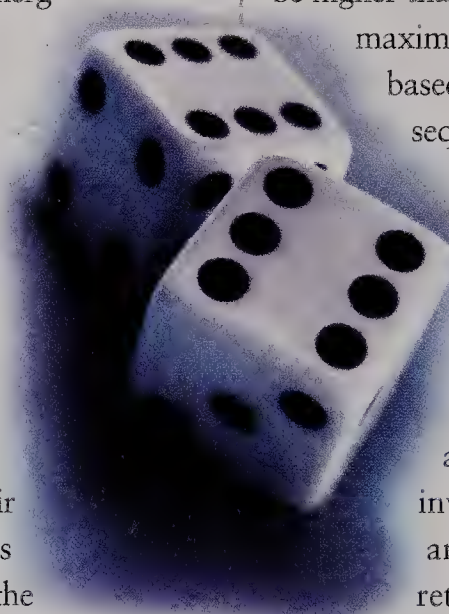
number. So the manager says, "100,000," the average. So the boss plugs that figure and the cost of building a 100,000-chip-capacity plant into a spreadsheet. The bottom line is a healthy \$10 million, which he reports to his board as the average expected profit. Assuming that demand is the only uncertainty and that 100,000 is the correct average, then \$10 million must be the best guess for profit. Right? Wrong.

What Savage calls "The Flaw of Averages" ensures that average profit has to be less than the profit associated with the predicted average demand. If demand is less than 100,000, then profits will be lower than \$10 million. But the profits can *never* be higher than \$10 million because the maximum capacity of the plant is based on a flawed average. Consequently, the product manager's correct forecast of average demand leads to an inflated forecast of average profit.

Savage predicts that in time every executive managing plant capacity, every investor with a stock portfolio and every employee with a retirement fund will be running Monte Carlo simulations to test their intuitive assumptions about average returns and average losses.

But that's just one example of how people trip themselves up. There are others. A thick body of research affirms that individuals think about their purchases differently depending on whether they use cash, credit cards, debit cards or checks. They also put a much higher value on something they already own than on the same thing if offered for sale. This "prospect theory," which won the 2002 Nobel Prize for professor Daniel Kahneman and cited his research partnership with the late Amos Tversky, helps explain why people hold on too long to losing stocks or pay way too much to insure themselves against small losses.

MIT Sloan School of Management



professor Dan Ariely and his graduate students are experimenting with an “electronic wallet” that would advise users on how best to spend their money. For example, your wallet may run a Monte Carlo simulation displaying how, based on your payment behavior, you would save \$150 over the next three months by using cash for a purchase instead of your Visa card.

In other words, tomorrow’s technologies will load the dice in favor of people not repeating the sort of silly statistical mistakes that lead to Nobel Prize winning research. And that will merit a prize of its own.

—Michael Schrage

SCREEN TECHNOLOGY

43. Thin Is In

DISPLAYS FOR COMPUTERS and handheld devices keep getting lighter and thinner, and now two new technologies—OLEDs and E Ink—promise to take this trend to the next level in 2003.

OLEDs: OLED (organic light-emitting diode) displays using organic films—instead of the crystal-based LCDs now commonly used in laptops and other portable machines—are advantageous in several ways. They are thinner, brighter, lighter, almost unbreakable, provide a wider viewing angle, have a faster response time and require much less power. Rochester, N.Y.-based Eastman Kodak has begun manufacturing tiny 2.2-inch screens. Later in 2003, OLED displays are likely to turn up in cell phones and digital cameras but also have potential uses in computers and even industrial lighting.

Nigel Deighton, vice president and research director for

Thin OLED (organic light-emitting diode) screens will be available in 2003, but not yet in color.

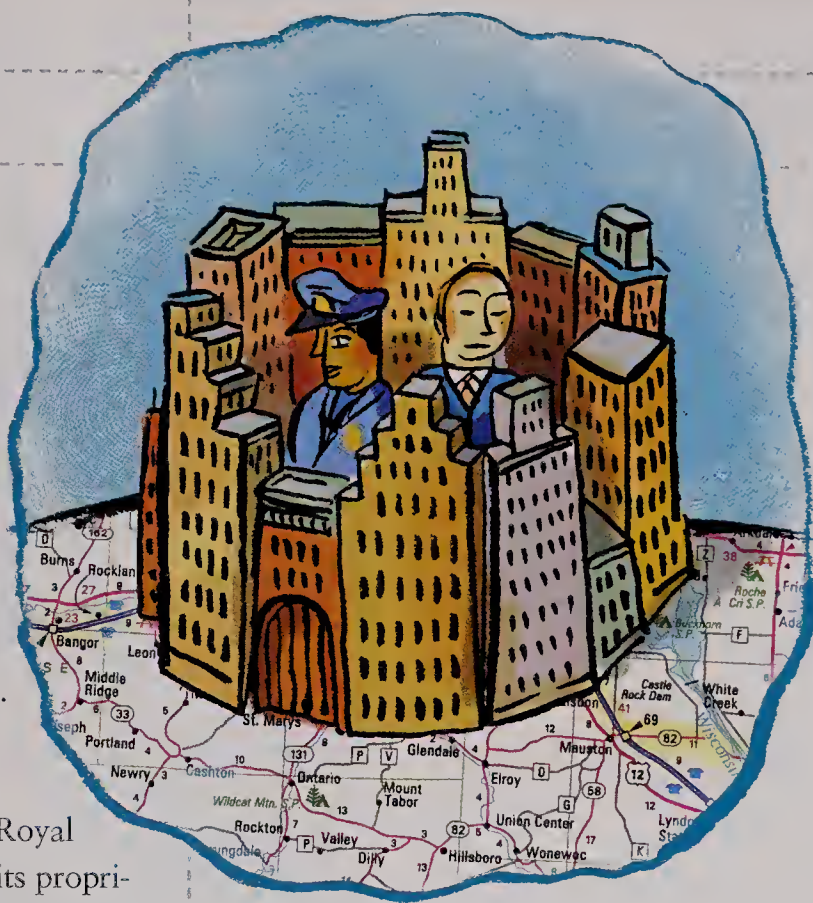


Gartner, says “OLED definitely has the potential to replace LCD. Just the fact that you can see an OLED screen in sunlight, unlike the LCD screen, will make a huge difference.” He predicts that the technology will launch in 2003 as black-and-white screens but will likely turn to color sometime in the next couple of years.

E Ink: E Ink Corp. of Cambridge, Mass., is working with display manufacturers such as Royal Philips Electronics to laminate its proprietary E Ink onto computer displays, handhelds and just about any other material. E Ink consists of microcapsules containing black and white pigments that can be manipulated with electrical charges. Millions of microcapsules (each about the diameter of a human hair) are suspended in a liquid medium which can then be fixed onto almost any surface: glass, plastic, fabric, even paper. The microcapsules create a pixel-like effect to make a superior display in terms of legibility, durability and power consumption. A prototype computer display released last summer was made of E Ink on unbreakable steel foil bound to a plastic sheet. It was 0.3 mm thick, or half the thickness of a credit card. Russell Wilcox, cofounder, vice president and general manager of E Ink, says the joint venture with Philips will result in commercially available displays for PDAs and cell phones by the end of 2003.

“The potential for these technologies is amazing,” says Deighton. “OLED and E Ink technology have the potential to break the usability barrier of small devices. You can envision being able to wear [E Ink] in clothes, have it in a pen. You could roll up a monitor [with E Ink] and attach a cell phone to it rather than carry a laptop.”

—Mindy Blodgett



CYBERTHREATS

44. Think Federally, Secure Locally

WHEN THE PACIFIC Northwest Economic Region (PNWER) needed a regional cybersecurity vulnerability assessment, it didn’t run to the feds. Instead, the group developed its own exercise, called Blue Cascades, that explored what would happen if critical services like the electric grid or the Internet were lost. PNWER—a partnership of elected officials and corporate executives from five U.S. states, two Canadian provinces and one Canadian territory—sought advice from federal agencies but ran its own exercise in Welches, Ore., last June 12. “There has to be a place where industry is playing a lead role and there’s a climate of trust,” concludes Matt Morrison, PNWER’s executive director. “Every federal agency has been saying, Give us data about your vulnerabilities, but nobody knows what they’re going to do with it.”

Cyberthreats may be global, but cybersecurity is everyone’s responsibility.

Ideas 2003

Regional, statewide or local partnerships can map out a ground-level view of critical services and what's needed to defend them. Watch for more partnerships like PNWER's Partnership for Regional Infrastructure Security to emerge this year. "This is our home turf, and we know it," says Ray Nelson, executive director with the Commonwealth of Kentucky's Office for Security Coordination. "What may be critical to the feds may not be critical to a county."

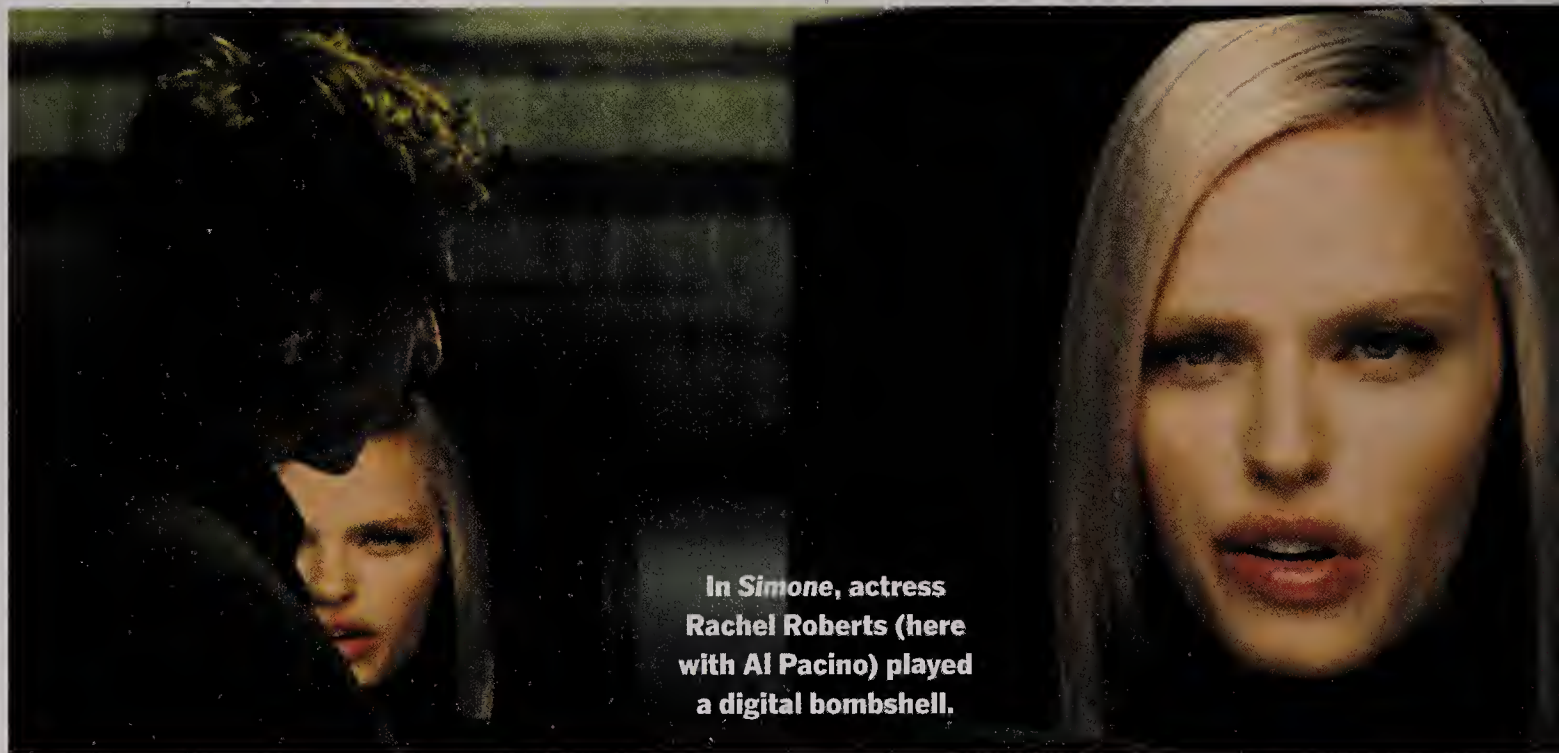
Companies have an incentive to work with the government because it's cheaper than going it alone. "You can spend all your own money trying to [be secure], or you can learn from other people in your industry and the government," says Jacques Gansler, the Roger C. Lipitz chair in public policy and private enterprise at the University of Maryland School of Public Affairs. So far, most information-sharing has occurred between companies and the federal agencies that regulate them. The feds have also encouraged companies within the same industry to share information about specific threats, vulnerabilities, and countermeasures through Information Sharing and Analysis Centers (ISACs).

While the ISACs have developed industry-specific security plans, companies are often more comfortable sharing vulnerabilities with the business next door. "They have built relationships on trust," notes Richard Clarke, special adviser to President Bush on cyberspace security. He says regional groups also know best, for example, which bridges carry fiber-optic cables or which local experts could secure a city's 911 system.

William F. Pelgrin, director of the New York State Cybersecurity and

Critical Infrastructure Coordination Office, wants to bring industry and government representatives together every quarter. "It's not only so we don't reinvent the wheel, but also so we can build relationships across sectors." Those relationships are essential to address interdependencies, he says. When PNWER did its attack simulation, scenarios included: shutting down the Internet; attacking electric utilities, telecommunications and gas pipelines; contaminating a city's water supply; and threatening ports with nuclear weapons. Participants uncovered deficiencies in their ability to report and receive information about infrastructure failures, so the group wants to develop a regional communication system to warn companies and agencies about threats or attacks, and to connect the public and private organizations that would be responsible for restoring services. The federal government's role, could be to provide funding or technical expertise to build that regional communication system, says Paula Scalingi, the former head of the U.S. Department of Energy's Critical Infrastructure Protection Office who is now helping PNWER develop its regional partnership for infrastructure security.

—Elana Varon



In *Simone*, actress Rachel Roberts (here with Al Pacino) played a digital bombshell.

ENTERTAINMENT

45. Virtual Stars Boffo in Tinseltown

A NEW BREED OF ACTOR is taking a star turn in Hollywood. They don't hide out in their trailers, check into rehab in the middle of a shoot or sleep with their costars. They do their own stunts, can shoot take upon take and don't require residuals.

Digital actors. Synthespians. Virtual stars. Whatever you want to call them, these artificially rendered stand-ins are popping up in more movies, from a major character in the latest *Lord of the Rings* installment to the eponymous lead in next summer's *The Hulk* to various characters in *The Matrix Reloaded* due out in May. High-tech special effects houses are using ever-advancing computer generated imaging (CGI) artistry and motion-capture technology to take the movements and voices of real actors and create a digital depiction of their actions and expressions. Such techno-tricks have created virtual backdrops and minor background characters for some time; it's the human qualities portrayed on-screen that are getting better and leading to better roles.



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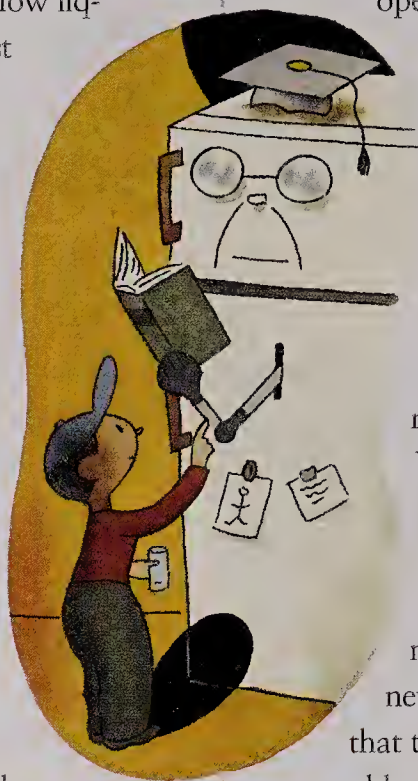
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In theaters now, *Lord of the Rings: The Two Towers* showcases the character Gollum, a hobbit-like creature who is digitally transformed into something far more frightening because of his extended encounter with the ring. He'll be one of the the most lifelike synthesians seen on the big screen, according to director Peter Jackson. Using the voice and movements of real-life actor Andy Serkis, Weta Digital, the Wellington, New Zealand, effects house working on the *Rings* trilogy, created the virtual actor using fluid dynamics (the study of how liquids and gases move) and vast amounts of new modeling codes that allow for convincing joint movement and translucent, fleshlike skin. At Industrial Light & Magic, the technology once used to create aliens is being used to generate photo-realistic digital doubles to perform stunts when a human actor can't, says Cliff Plumer, CTO of San Rafael, Calif.-based ILM. The company that used digital actors in the fight scenes in *Episode II: Attack of the Clones* and explosions in *Pearl Harbor* now creates digital models of main characters in its movies.

Even so, stars like Gwyneth Paltrow and Jim Carrey have little to fear. For one thing, close-ups can be tricky, even though ILM is applying tools it used with *The Perfect Storm* in trying to get there, Plumer says. And, adds Ilyanne Kichaven, spokeswoman for the Screen Actors Guild in Los Angeles, "There will always be a need to see real performers on the screen."

And, of course, it takes more than acting—virtual or real—to make a winning film. *Simone*, starring Al Pacino as the creator of a digital blonde superstar (played by the very real Rachel Roberts), bombed at the box office in 2002. It's unlikely that a synthesian could have saved this film that critic Roger Ebert says was "too shallow a picture."

—Stephanie Overby



FUTURE TECHNOLOGY

46. Smart Appliances, Really Slow Networks

EVEN IN PLAYA VISTA, the futuristic community in Los Angeles's Westside due to open April 2003, Internet-

enabled smart kitchen appliances are having a hard time finding a home.

Original plans called for Playa Vista's homes to come equipped with refrigerators, microwaves, convection ovens and dishwashers that could be remotely controlled by wireless, Web-enabled tablet PCs, according to Tom Kline, a spokesman for Whirlpool, the Benton Harbor, Mich.-based manufacturer of all this jazzy new stuff. But after it realized that the average American abode resembles a Playa Vista pad about as closely as an armadillo does an antelope, Whirlpool decided to delay this plan until the broadband infrastructure necessary to support such devices is available, though the company is still developing the technology. It just didn't make much sense for Whirlpool to market gadgets that only people living in test-bed communities could use. Indeed, this lack of a pervasive high-speed Internet infrastructure remains the biggest barrier to the mainstreaming of smart appliances, which have been much hyped and promised ever since about the time *The Jetsons* made its debut on TV. (That was, for trivia buffs, 1962.)

So, instead of a refrigerator that will order your milk for you over the Web, Whirlpool is furnishing

Playa Vista homes with refrigerated ranges that keep casseroles cool until the time comes to cook them and armoires that remove odors and wrinkles from your clothes. That's pretty smart, but it's not "smart"; neither gadget requires anything more than electricity to do its job. Though the company is also planning future models of the refrigerated range and armoire that will be controlled through the Internet.

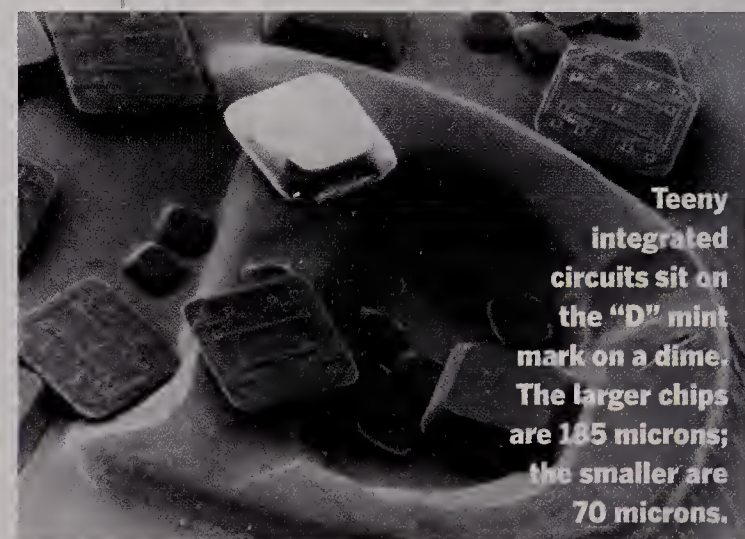
In the meantime, while Whirlpool and its competitors continue to dream about Internet-enabled domestic solutions, Korean manufacturer LG Appliances recently unveiled a 356-pound, fingerprint-proof, Titanium-coated refrigerator that functions as a TV, PC, calendar, stereo and photo album.

Oh, and it also freezes water and keeps food from spoiling. —Meridith Levinson

NANOTECHNOLOGY

47. The Next Little Thing

LOOK OUT WEB SERVICES, you're about to be out-buzzed by a small fry called nanotechnology. Perhaps the Next Big Thing on the horizon, nanotechnology is the science of manipulating materials on an atomic or molecular scale. Though it's still early, engineers at some of America's major computer companies are making headway with nanotechnology, announcing breakthroughs in research and potential new products.



Teen integrated circuits sit on the "D" mint mark on a dime. The larger chips are 185 microns; the smaller are 70 microns.



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Ideas 2003

At the forefront of this research are superconducting carbon nanotubes—tiny tubes of conductive carbon atoms that are being used to build transistors. Nanotubes are behind Hewlett-Packard's recent announcement of a 64-bit memory chip, a chip so small that thousands can fit on the end of a single strand of hair. A similar announcement from IBM regarding nanotube transistors says that the technology will enable the production of smaller, faster and low-power computer chips than what is currently possible with silicon.

Even skeptical industry analysts are impressed with those not-so-small feats. Christine Peterson, president of the Foresight Institute, a nonprofit organization that focuses on nanotechnology, finds the research of these companies and nanotechnology's future encouraging but says that "the challenges are still huge." But those huge obstacles seem like something nanotechnology can shrink down to size.

—Julie Hanson

MOBILE TECHNOLOGY

48. You've Got the Whole Enterprise in Your Handheld

CIOs HAVE SPENT BILLIONS Web-enabling enterprise systems in order to facilitate and reap the benefits of B2B e-commerce. While they anxiously await a return on those investments, they may not realize that they already have—clutched in their hot little hands, stuffed in their starched pockets or hanging from their leather belts—a killer app that will help them recoup those megabuck investments. Know what it is?

It's a handheld computer.

Thanks to 2.5G voice data transports, which are turning cellular networks into



Will PDAs consign desktops and laptops to the trash bin of technology history?

voice data networks and which will provide a continuous, uninterrupted wireless connection, companies will finally be able to use wireless PDAs to access corporate information. "Everyone's wanted to do that for a long time," says Jim Balsillie, chairman and co-CEO of Research In Motion, the Waterloo, Ontario-based manufacturer of RIM and BlackBerry devices. "There's now a way to do that."

New product offerings and upgrades targeted for the enterprise market from Good Technology, Hewlett-Packard, Microsoft, Palm and RIM are expected in 2003. An upgrade of a high-end version of HP's iPAQ will be able to connect with mobile networks, starting with general packet radio service, a wireless standard. Palm, which last September unveiled its Tungsten Mobile Information Management Solution that lets users access their e-mail on their Palm i705 and m500 devices, is working with IBM and BEA Systems on new versions of WebSphere and WebLogic applications for its operating system, due for release in 2003. Microsoft is developing Portrait, an appli-

cation that enables users to hold two-way, full-color video conferences on their PDAs.

For an example of a company using PDAs to make IT workers more responsive and salespeople more effective, there's Electronic Arts. The Redwood Shores, Calif.-based video game developer is replacing technology from RIM with hardware and software from Good Technology.

If a router fails on Electronic Arts' website, for example, engineers receive on their Good G100 devices (which never have to be placed in a cradle to sync) an alert from the operations center with an attachment listing various actions they can take to correct the problem, says Marc

West, Electronic Arts' senior vice president and CIO. In the past, after receiving notice of a problem on their RIM devices, engineers had to call or e-mail the operations center to find out what was wrong and what to do about it.

Electronic Arts is also testing Good Technology's data retrieval service, which the sales force will soon be able to use to place orders and access customer data.

In addition to RIM devices, the G100s are starting to replace laptops at Electronic Arts. West, for example, no longer takes his laptop home at night. And the more laptops West can replace with G100s, the more money he has for new technology.

"Take out 10 laptops and you pay for the basic infrastructure. Take out another three and you pay for the average monthly fee," West says. He advises CIOs interested in wireless PDAs to make a list of those employees with ISP connections, AT&T Global accounts and dial-up remote access services at home—ongoing expenses for the company. Then, "the next person that asks [you] for a laptop, ask them what they're using it for. If they're just using it for e-mail, give them one of these devices instead," he adds. —Meridith Levinson

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Enterprise Value Retreat &

JANUARY 26-28, 2003, MARRIOTT DESERT SPRINGS, PALM DESERT, CALIFORNIA

SUNDAY, JANUARY 26

8:00 AM - 1:00 PM
Golf Tournament

3:00 PM - 7:00 PM
Registration & Super Bowl XXXVII Party

7:00 PM - 9:00 PM
Dessert Reception & Golf Awards

MONDAY, JANUARY 27

7:00 AM - 8:00 AM
Networking Breakfast

8:00 AM - 8:15 AM
Welcome
ABBIE LUNDBERG
Editor in Chief
CIO Magazine

8:15 AM - 8:45 AM
Opening Keynote:
The Value Proposition
GREGOR BAILAR
*CIO Enterprise Value Awards Judge,
and Executive Vice President &
CIO Capital One*



How do we determine "value?" Direct, measurable financial ROI is only one way – and may not be the most important measure of a new business initiative's

success. Bailar has served as a judge for the Enterprise Value Awards for the past four years. He was executive vice president and CIO at Nasdaq, and vice president of advanced development for global corporate banking at Citicorp N.A. These experiences have given him broad insights into how the definition of value has shifted over the years, and if that shift continues to be reflected in this year's winners.

8:45 AM - 10:30 AM

Case Study: Don't Just Lead, Govern: Effective IT Governance
PETER WEILL

*Retreat Moderator and Director,
Center for Information Systems
Research*

MIT Sloan School of Management



IT governance is the decision rights and accountability framework that can ultimately result in maximizing the value of IT throughout the enterprise.

Effective IT governance encourages and leverages the ingenuity of all the people in the organization – not just the leaders – while ensuring compliance with the organization's overall vision and goals. Weill will guide us through a real-world case study, and present findings derived from a new study of 265 enterprises in 23 countries. Retreat participants will then form small working groups over lunch to further analyze the case, and will present their own findings and recommendations to the whole audience Tuesday morning.

10:30 AM - 11:00 AM
Coffee Break

11:00 AM - 11:45 AM
Corporate Partner Industry Briefings

12:00 PM - 12:45 PM
Corporate Partner Industry Briefings

1:00 PM - 3:00 PM
Lunch & Case Study
Workgroup Breakouts

3:00 PM - 3:30 PM
Break

3:30 PM - 4:15 PM
Enterprise Value Award Winner
Presentation: U.S. Securities & Exchange Commission (SEC)

The SEC's goal: automated quick and accurate receipt, processing and dissemi-

nation of financial disclosure information filed with the SEC by public companies. SEC executives share the outcome: their Electronic Data Gathering, Analysis and Retrieval (EDGAR) system.

4:15 PM - 5:00 PM
Enterprise Value Award Winner
Presentation: Health Decisions

Health Decisions clinical and IT executives offer lessons learned from their Clinical Trials Management System, and discuss its potential impact on the process of evaluating new drugs.

5:00 PM - 5:30 PM
Special Address

5:30 PM - 7:00 PM
Networking Reception
Exchange views, best practices and challenges with your peers in a relaxed environment.

7:00 PM - 9:30 PM
Corporate Partner Hospitalities

TUESDAY, JANUARY 28

7:00 AM - 8:00 AM
Breakfast & Informal Discussion
Roundtables

Join your peers and CIO magazine editors in informal roundtable discussions on current technology and business issues.

8:00 AM - 8:15 AM
Welcome Back
PETER WEILL

8:15 AM - 9:15 AM
Workgroup Presentations/Executive
Reactions

Representatives from yesterday's case study workgroups present their findings and recommendations to their peers and to a representative from the case study company.

Awards Ceremony 2003

9:15 AM - 10:15 AM

Managing the IT Portfolio

PETER WEILL

Just like any other investment portfolio, the IT portfolio must be balanced to achieve alignment with the business strategy and the desired combination of short- and long-term payoff. Weill describes benchmarks of IT portfolios, uses video interviews with IT and business executives from UPS to illustrate how significant value is generated, and shows how some firms were able to achieve up to a 40% premium return on their IT investments.

10:15 AM - 10:45 AM

Coffee Break

10:45 AM - 11:30 AM

Enterprise Value Award Winner

Presentation:

University of Illinois Medical Center at Chicago

IT and business executives discuss how their Gemini System enables electronic health records to replace all paper dealing with patient care, integrate multiple vendor products into a single-user interface, and provide ubiquitous access (including Wi-Fi) to caregivers.

11:30 AM - 12:15 PM

Corporate Partner Industry Briefings

12:15 PM - 1:45 PM

Networking Lunch

2:00 PM - 2:45 PM

Enterprise Value Award Winner

Presentation:

Con-Way Transportation

Con-Way IT and business executives share their experiences developing and implementing their award-winning Linehaul Automation system, and discuss the benefit to them, their employees and their customers.

Marriott Desert Springs Resort & Spa



A lush oasis amid pristine open desert, the Marriott Desert Springs Resort & Spa is surrounded by lagoons and lakes at the foot of the Santa Rosa Mountains. It features two 18-hole Ted Robinson-designed championship golf courses, and a 30,000-square-foot European Health Spa. The resort has amenities and activities for the entire family and is near many Desert Springs attractions, including Indian Canyons, Palm Springs Aerial Tramway and The Living Desert.

2:45 PM - 3:30 PM

Enterprise Value Award Winner

Presentation:

The Wharton School of the University of Pennsylvania

Academic and IT executives at The Wharton School set out to develop an Internet-based research data service for use by their own faculty and students. They discuss how the resulting system – Wharton Research Data Services (WRDS) – gave them a whole new business model.

3:30 PM - 4:15 PM

Closing Keynote: Technology, Value... & Values

JARON LANIER

Computer Scientist, Artist & Author

Lanier's wide-ranging interests and considerable talents have earned him recognition in seemingly disparate fields,



including virtual reality, visual arts, software simulations and music. Here, we take advantage of his reflections on technology, society and humanity: Technology has indeed

generated much value for business – but has it contributed much toward our values?

4:15 PM - 4:30 PM

Retreat Summary & Reflection

PETER WEILL

4:30 PM - 5:30 PM

Reception with Jaron Lanier

7:15 PM - 9:30 PM

Dinner and Enterprise Value Awards Ceremony

Put on your evening wear and join your peers, CIO staff and corporate partners as we celebrate the winners of this year's Enterprise Value Awards.

9:30 PM - 11:00 PM

Post-Awards Dessert Reception & Party

Dance the night away – or just mingle with colleagues old and new as we bring this year's Retreat to a close.

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Emerging technology

INNOVATION and PRODUCTS in the VANGUARD

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Nanowires 108

Company to Watch

Corworks 110



Process Power

The latest process management tools put business users in control

BY MARTIN LAMONICA

Edited by Christopher Lindquist. Send your thoughts and ideas for future columns to clindquist@cio.com.

CREDIT GIANT TransUnion's nascent mortgage and personal loan business is growing fast, and Executive Vice President and CIO Len Lombardo will not let technology slow it down.

"We don't want any software package put-

ting restrictions or dictating how our business can act," says Chicago-based Lombardo. "Our product guys are very creative, and there's so much competition out there. We've got to be able to react."

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Lombardo's need for speed and flexibility rings true in nearly any business. Ideally, companies should be able to quickly automate their business processes while also being nimble enough to optimize those processes over time. In practice, companies often find themselves bound to the business rules hard-wired into their enterprise applications because modifying the software is so difficult.

Business process management (BPM) software seeks to turn the tables. BPM tools are designed to let CIOs and end

nectors to enterprise applications.

Many experts argue that BPM is the killer application for Web services. Once Web services becomes more commonplace, end users and business analysts without extensive training should be able to design and build process workflows that tie together, or "orchestrate," several prebuilt services. IT organizations, relieved a bit of the application backlog, will then have time to focus on IT infrastructure and system-to-system process automation—or at least that's the hope.

Companies should be able to quickly automate their business processes while also being nimble enough to optimize those processes over time.

users take a process-centric approach to IT projects and to track the effectiveness of those corporate processes. With many companies doing the same amount of work with fewer employees, business process efficiency may well be the next stage of business-IT innovation.

Process Improvement by Design

Although workflow-oriented software has been around for years, a new generation of BPM software is spreading beyond the leading-edge user set. Founded in 1992, the Business Process Management Group—a U.K.-based user organization—boasts more than 2,500 members, 200 of which joined during the past few months.

Vendors of many stripes—integration middleware, workflow and enterprise applications—are converging on BPM as well. Because so many software products now include embedded workflow engines, a precise definition of BPM is tricky. But the most common feature set includes a business-process-modeling tool, a run-time engine to execute and monitor processes, and a development environment with con-

nectors to enterprise applications. But perhaps most compelling, BPM technology is versatile enough for all manner of applications. Just ask Shell Oil.

Shell U.S. Tax Organization in Houston wasn't in the market for BPM software when it had a mandate to cut its monthly financial reporting time in half and provide a clear trail in case of audits. The core problem—common to large enterprises—was the heterogeneity of the systems involved, including geographically dispersed divisions running primarily SAP R/3 but also J.D. Edwards and Oracle Financials, says John Antaki, former technology adviser for the Tax Organization who is now a managing partner with Matrix5 Consulting in Houston.

Shell found that TeamWorks, the BPM software from Lombardi Software, could handle the enterprise application integration capabilities found in many middleware products but didn't require extensive coding—the application was up and running within three months. And because the team could quickly prototype business processes with the tool, financial analysts and IT people focused more on evaluating how they worked, rather than the techni-

cal underpinnings of the software.

"The key is the business process," says Antaki. "The effort is in deciding which area of the business process you want to automate and finding the bottlenecks that have the greatest challenges."

Shell recouped its \$1 million investment in fewer than six months and helped derive more value from its \$1 billion SAP investment, Antaki says. Now the company is looking to roll out BPM software in other operations, including exploration, refineries and financial services, he says.

Beyond automation, examining business process in a BPM implementation is also a significant benefit, according to users. "The tool and method force you to look at processes and understand how they work," says Philip Parker, CIO and vice president of Addison, Texas-based United Surgical Partners, a chain of surgical facilities. "As a result, you tend not to automate what exists; you tend to ask, What does the process need to do?"

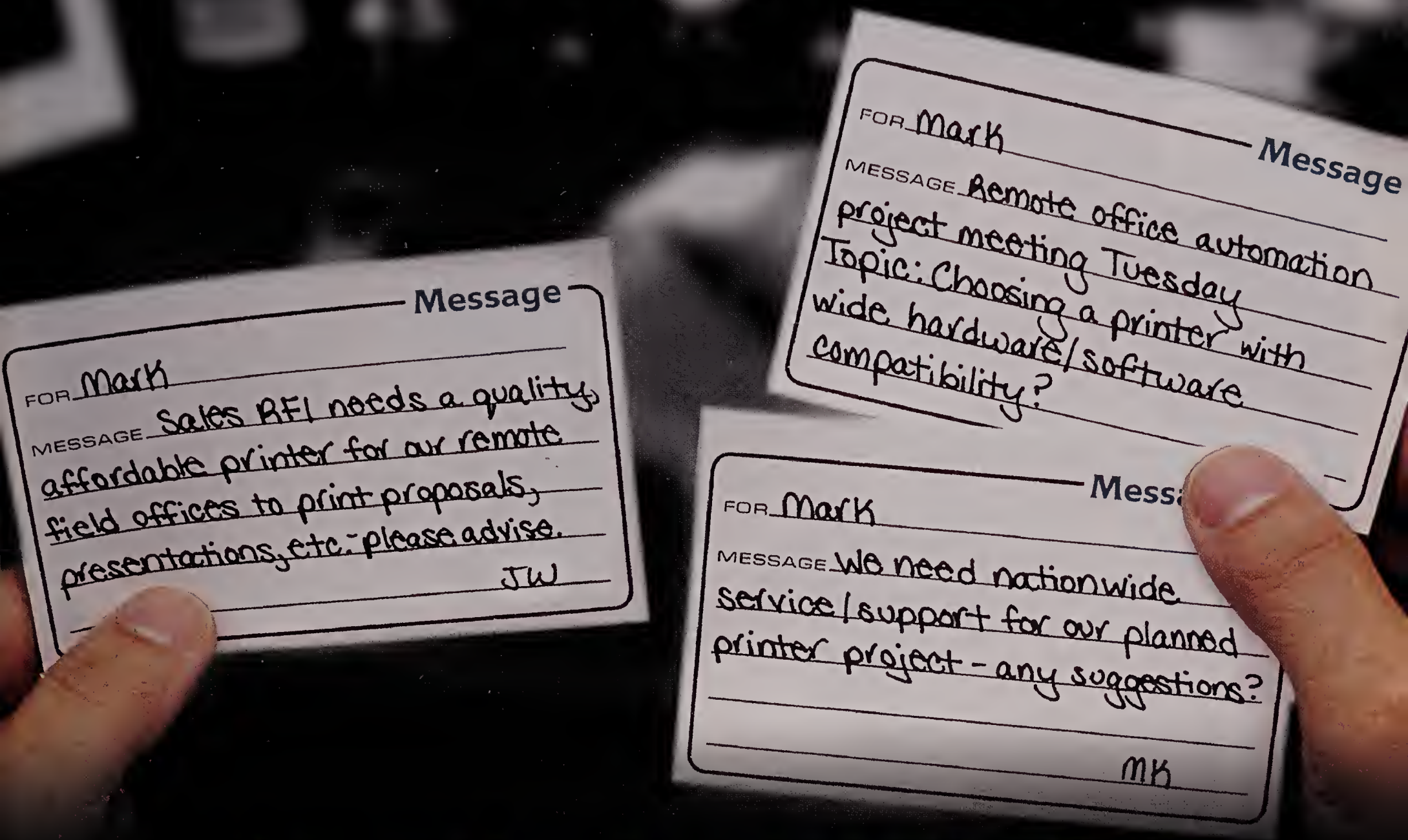
United Surgical has implemented one BPM application using software from Fuego that normalizes data from multiple financial reports. Going forward, Parker expects his IT and business analysts will spend 80 percent of their time documenting and analyzing processes for new applications, with the remaining effort to be split between tuning existing processes and creating new components for the BPM system.

Old Wine, New Bottle?

Business process automation in software, of course, is nothing new. But the convergence of many vendors around BPM is creating a hotly competitive market.

A flurry of pureplay BPM startups have cropped up, such as Fuego, Intalio, Lombardi Software, Q-Link Technologies and Savvion. Workflow products from com-

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panies such as FileNET and Staffware, originally oriented toward document management and end user workflow, are now beefing up their wares with better connectors to enterprise applications.

Meanwhile, integration middleware vendors, such as Tibco Software and WebMethods plus Java application server vendors IBM and BEA Systems, are eyeing BPM as a growth area. Even enterprise application vendors, including SAP and Siebel Systems, are introducing workflow engines into their suites.

The crowded playing field makes vendor choice tricky for CIOs. A supplier's pedigree—end-user-oriented workflow

for modeling a business process. Other standards include the business process modeling language (BPML) and ebXML (electronic business using extensible markup language).

Analysts say that it will take some time for one dominant standard to emerge, and that in the near term it's unlikely that a single specification will address all business process standards scenarios, such as internal automation versus business-to-business.

Even with standardization, analysts warn CIOs to pick suppliers carefully and expect industry consolidation. As a sign of things to come, IBM in September

Despite growing interest, BPM tools still haven't caught on broadly with end users and business analysts.

or back-office application-to-application integration—will help determine how appropriate a technology is for a given application, analysts say. Often, IT executives need to choose between a best-of-breed product that connects well to third-party software or go with a BPM product from an incumbent vendor that integrates tightly with a company's existing architecture, says David McCoy, vice president and research area director at Gartner in Stamford, Conn.

"The problem is you have these vendors who think it's their God-given right to have process management inside their products, but they're not doing anything in a standardized way," says McCoy, who predicts that many companies will have as many as eight different tools that support process management within two years.

To help the situation, numerous BPM and workflow standards have been proposed by various industry groups during the past year. In July, Microsoft, IBM and BEA threw their weight behind BPEL4WS, or Business Process Execution Language for Web Services, an XML-based language

acquired longtime partner Holosofx with the goal of integrating Holosofx's business process modeling and tracking tools with IBM's MQSeries Workflow and WebSphere application server.

Getting on the Same Page

Considering that most business process modeling in enterprises is done with Microsoft's Visio diagramming tool, one of the key benefits of BPM is the ability to create a live link between business models and production systems, say analysts and vendors. Having a single business process diagram that both business and IT workers use, either for process modeling or coding, helps drive alignment between business and IT. And once processes are effectively documented and reviewed, businesses gain a lot in process knowledge.

"You're actually capturing best practices," says Antaki of Shell Oil's experience with BPM. "So if you have high turnover, new people are coached to perform to the same standard and level as the top person in the organization. You get a productivity improvement."

Cool Product

Adobe's Serve

ADOBE HAS ANNOUNCED the availability of several new and upgraded server products designed to let companies integrate PDF documents more effectively into their daily business workflow.

The Adobe Document Server will help companies build applications that can create on-the-fly PDF documents using information from a variety of sources. For instance, a customer of a computer manufacturer would be able to download a customized computer user guide based on the exact configuration of the system it just purchased.

The Adobe Document Server for Reader Extensions assigns "usage rights" to PDF documents. Administrators can then determine whether readers can save files locally, add their own comments, apply digital signatures or even authorize online approvals.

The products will be added to an updated line of server products that includes Adobe Form, Workflow and Central Output servers. All of the servers were scheduled for availability by the end of 2002. Pricing for the new products will be on a per-CPU basis and is expected to range from \$20K to \$75K per package depending on the product and configuration.

For more details and sales information, visit Adobe's website at www.adobe.com.

—Christopher Lindquist



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In fact, BPM advocates say CIOs should measure return of BPM projects not only on reduced cost but on process improvement. "The next level of business enhancement or rate of return is in process. You've got to bring about change in the process level," says John Koenigs, president and CEO at Savvion in Santa Clara, Calif. In effect, innovating at the process level makes the CIO a businessperson, says Koenigs.

But despite growing interest, BPM tools still haven't caught on broadly with end users and business analysts, who ultimately know the most about business processes. Allmerica Financial, an insurance and financial services company in Worcester, Mass., decided to avoid the industrial-strength, back-end process automation offered by many workflow and middleware vendors. Instead, CIO Greg Tranter spent about \$50,000 building its first application using a desktop-oriented BPM product from Nobilis Software. He expects subsequent applications will let business users automate and modify their own processes without IT's involvement.

"What ends up happening is that business users like to change underwriting guidelines very frequently if they see things changing in the market. This lets them change things on the fly," says Tranter.

Not all companies have technically savvy end users or strong process orientation. Still, companies such as United Surgical Partners are making the jump to BPM, in part to make the company's existing staff more productive but also to understand more about their corporate processes. United Surgical Partners' Parker is devising a centralized BPM application to gather key performance indicators from the underlying systems and provide alerts or reports to top management.

"We're in a constant process improvement model," says Parker. "If we stop improving, we're in trouble." ■

Martin LaMonica is a technology and business writer based in Arlington, Mass. He can be reached at martinlamonica@hotmail.com.



UNDER DEVELOPMENT Nanotechnology

Unseen Stripes

IMAGINE A NANOWIRE—10,000 times thinner than a human hair—that can function as a transistor, a light-emitting diode, a biochemical sensor and many other devices, all along a single "candy-striped" strand.

The practical applications of such technology could include computer chips that are orders of magnitude more dense than today's best designs. And work at the Ernest Orlando Lawrence Berkeley Laboratory in Berkeley, Calif., is pushing to make this seemingly science-fiction idea become a reality.

Conventional semiconductor devices combine multiple layers of semiconductors, put together much like a sandwich. But the Berkeley Lab is developing a platform for using one-dimensional nanostructures—allowing for far more compact combinations of extremely tiny devices, says Peidong Yang, a chemist with Berkeley Lab's Materials Science Division. Ultimately, the research could result in computer chips that hold billions—instead of millions—of transistors.

As part of its research, Berkeley Lab recently created striped or "superlatticed" nanowires composed of two different semiconductors: silicon and silicon-germanium alloy. The goal is to be able to place "junctions" on individual wires, with each junction performing a function—such as emitting light or converting energy.

The researchers create the nanowires by heating a gold-plated silicon wafer in a 1-inch furnace to create "nanometer-size" droplets of the materials. They then subject the droplets to a laser that is turned on and off to deposit alternating patterns of gold, silicon and germanium into a superlattice. While it sounds complex, the researchers claim it is actually quite inexpensive and quick—they can reportedly create millions of striped nanowires per hour.

"I believe this will be a technology enabler. It will make other functionalities possible from these semiconductor nanowires in the years to come," Yang says.

—Matthew W. Beale

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COMPANY TO WATCH

Corworks

Data Diets

Corworks' compression tool trims the fat off storage

BY TODD DATZ

ACCORDING TO Brian Farrell, CEO of Corworks, data volume doubles roughly every eight months: If you have 20 terabytes of data today, you'll be reaching the petabyte plateau sometime in 2005.

That's a lot of disk space—and possibly millions of dollars in hardware costs.

Stamford, Conn.-based Corworks aims to help its customers deal with the exponential growth of data by, quite simply, making it smaller through compression. As an added benefit, users can also retrieve the shrunken bits more quickly at lower cost. With a foothold in data-intensive companies such as MasterCard, credit giant Experian Information Solutions and financing company CIT Group, Corworks has a solid chance of sticking around as the next chapters in the book of big data are written.

Digging for Data

Corworks was founded in 1996 by Chairman and CTO Andrew Dysart, with help from Principal Software Engineer Norbert Hom. After employing that age-old startup strategy of cold-calling potential customers ("That didn't work," says Farrell), the company decided to focus its efforts on those companies that were in the business of managing massive amounts of information. Sears, Roebuck and Co. was an early customer, as was credit bureau Equifax.

Farrell and his cohorts use the term *tera-inflation* to describe the overhead that relational database technology requires to support data. For example, 1 terabyte of data may actually consume as much as 5 terabytes of hardware processing

Corworks

Headquarters Stamford, Conn.**Founded** 1996**Employees** 24**Funding/sales** Private, self-funded**Products** Knowledge Server, Relationship Builder, Data Exchange**Reason to watch** Its data compression technology saves money on hardware costs and helps create more business intelligence opportunities from data**Hurdles to clear** Gaining market acceptance; competition from established data warehousing vendors**Website** www.corworks.com

space. "Relational technology alone just can't do it, especially in large installations," says Farrell. Andrew Clyne, vice president of information delivery product for global technology and operations at MasterCard's offices in Purchase, N.Y., would agree. On a peak day, MasterCard handles as many as 40 million transactions. Using Corworks technology, MasterCard compressed 42 terabytes of credit card data down to just 9 terabytes.

In the past, says Clyne, transactions were spun to tape. "It was cost prohibitive to buy that much disk and manage it over time," he says. If his staff needed to do research beyond 13 months, it went to the mainframe, spun tapes for the transactions, and processed them on the mainframe, a process that could take upward of eight weeks. "Now I can do that same effort in just a few days," Clyne says.

Farrell likens the technology to an

Iomega Zip disk, which also compresses technology, but that's where the analogy ends. Unlike a Zip disk, Corworks can capture intelligence and store it in the data object so that companies can operate on their data—read, query, update, delete—while its compressed. "We see this as a competitive advantage—our ability to leverage information and turn it into business intelligence for our member banks," says Clyne. The technology reduces the time and complexity involved when exchanging data with its members and gives MasterCard the capability to design new product offerings. Customers can also slice and dice the data more easily.

There are some hurdles to Corworks' growth in the marketplace, however. Richard Winter, president of database consultancy Winter Corp. in Waltham, Mass., says the Corworks product doesn't currently accept SQL, the standard language for data access. "That means they aren't a candidate for the mainstream data warehousing market," he says, though he adds that the company can still be successful as a specialty tool. He also notes that the big players in high-end data warehousing, such as IBM, NCR and Oracle, are also investing in data compression technology and won't make it easy for startups like Corworks to hone in on their territory.

Corworks flagship product is Knowledge Server, an open-platform software product. It also offers Relationship Builder, which allows users to create customer definitions any way they choose using existing data, and Data Exchange, which allows users to move data across the Internet or an intranet at faster speeds (the data is compressed to 20 percent of its original size). As far as Farrell's strategy for growth, he's focusing on a new marketing campaign to spread the word to other large data hubs such as large credit card issuers, government agencies and telecom companies. He's confident that Corworks has no place to go but up: "We have what people need, and the need is only getting bigger." **CIO**

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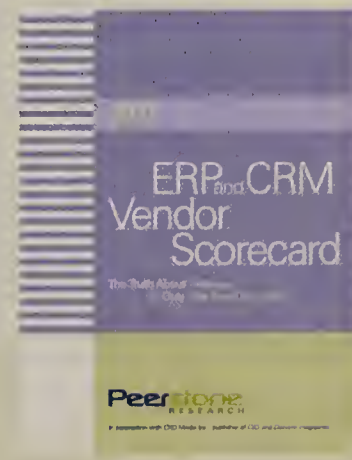
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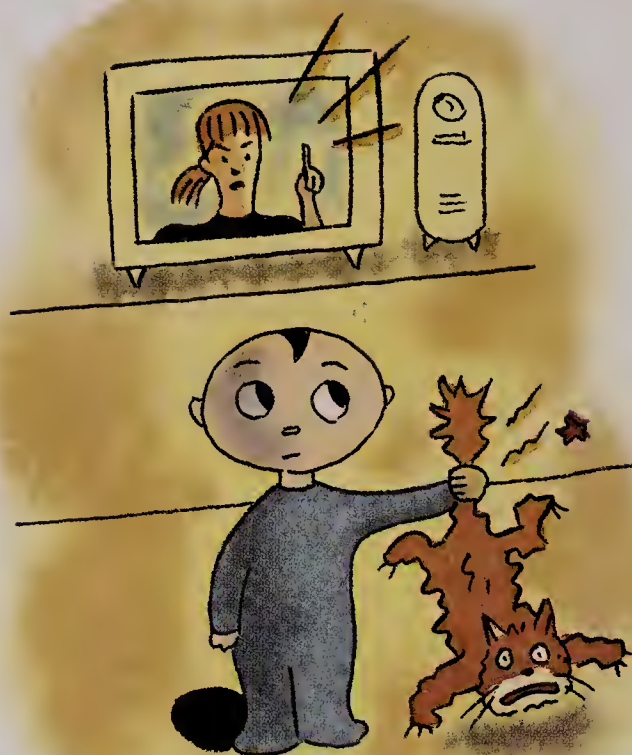
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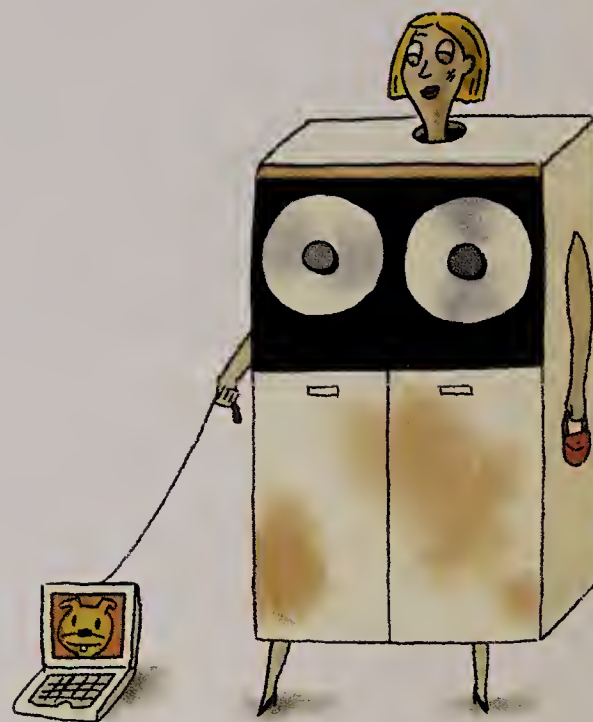
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